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THE LIVING BIRD

Quarterly

Winter 1985

Bird Photography Contest

Now's the time to enter the Laboratory of Ornithology's first bird photography contest. Winning photos will be presented in THE LIVING BIRD QUARTERLY. Winning photographers will have the opportunity to choose prizes from an array of top-quality camera equipment (see below). Our illustrious judges include Les Line, editor of AUDUBON, and W. Allan Royce, illustrations editor, NATIONAL GEOGRAPHIC.

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Winning photos will be selected on the basis of execution, artistry, and panache.

DEADLINE: Submissions must be postmarked no later than MARCH 15, 1985.

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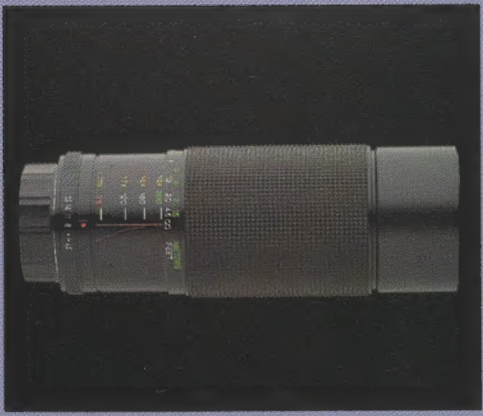

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Winter 1985
Volume 4 Number 1

THE LIVING BIRD Quarterly

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FRONT COVER. Outside—White storks, Alsace, France. Protected by the superstition that they bring luck, white storks nest on roofs from Holland to the Balkans. Photograph by M. P. Kahl (Black Star). Inside—Black-capped chickadee by Lynn Rogers.

BACK COVER. Outside—Common murres. Photograph by Stephen J. Krasemann/DRK Photo. Inside—Northern cardinal by Robert Copple.

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Mount St. Helens eruption had far-reaching effects. At right, ring-billed gull excavates its ash-covered nest in a colony 200 miles away.

JAMES MASON (BLACK STAR)

Breath of Vulcan

James L. Hayward

WHAT HAPPENS to a colony of gulls when a volcano erupts 200 miles away, spreading a blanket of ash over nests and eggs? I was in the position to find out; I was studying a gull colony that day in 1980 when Mount St. Helens blasted millions of tons of pulverized rock into the air.

My research had taken me to Sprague Lake, near Spokane, Washington, where I was monitoring factors influencing breeding success in ring-billed gulls nesting alongside California gulls. I had just completed censusing the colony when I suddenly became a participant in a major geological event.

May 18 had begun pleasantly enough. The sky was clear, the air inviting. A calm lake mirrored the azure canopy. But at 11:30 a.m. the tranquil mood was broken when a broad, dark cloud began closing in from the southwest. Inclement weather was not unusual; spring storms are common in the eastern Washington scablands. The approaching cloud looked like one from which a tornado had emerged the previous week. But this was no ordinary cloud. Two hundred miles to the southwest Mount St. Helens was erupting and three hours later, when volcanic ash fell like plaster of Paris, I made a hasty retreat into my cabin.

Experiencing a volcanic eruption was both exciting and frightening. Radio reports warned that driving in the ash spelled doom for automobile engines. Conflicting rumors on ash toxicity were issued hourly and breathing outdoors without inhaling the fine, siliciferous fallout was impossible. No one knew how long the mountain would fume and visions of carnage wrought by Mounts Vesuvius and Katmai played on my mind. After an afternoon of darkness I retired, unsure what the morning would bring.

Soon after dawn I awoke relieved to see daylight. The air was dust laden, but the ashfall was over. No insects flew. No birds sang. Carp gasped for air at the surface of the turbid lake.

I returned to the gull colony which now resembled a moonscape. A dusty gray pall draped the once green island. The colony had been buried beneath an inch and a quarter of ash. The gulls were on their territories, but a confused maze of tracks covering the area outside the colony indicated that it had been abandoned during the ashfall. Such a mass exodus was surprising because gulls usually remain on their nests even during the most severe weather.

As I approached, the birds flew up, circled and landed in a silent panic flight. This group response typically is given when aerial or nocturnal predators threaten, but was an unusual reaction to my presence in broad day-

JAMES L. HAYWARD

BHL

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light. The events of the previous 24 hours apparently made these animals excitable.

The birds appeared surprisingly healthy, except that more than half the California gulls showed signs of conjunctivitis: swollen eyelids, crusty feathers around the eyes, higher than normal rate of blinking. No ring-bills had this affliction and I assumed that something in each species' behavior accounted for the difference.

To my surprise, many of the gulls had uncovered their nests. Nest excavation continued for a few more days and on May 21 I determined that 70 percent of the California gull nests and 40 percent of the ring-billed gull nests had been uncovered. After that, no further excavation occurred. By June 27 nearly all of the nonexcavated ring-billed gull nests had been replaced by new nests, which apparently were built by gulls failing to excavate their nests. Some of the new nests were built directly over the buried nests, others were located outside the colony. Only a few of the nonexcavated California gull nests were replaced by new nests.

The percentage of excavated ring-billed gull nests varied depending on the habitat. The largest number excavated were in a rocky beach area and in sparse vegetation. The ash had not altered the major topographic features in these habitats, so the birds found their nest sites easily. However, in tall rye grass and in low dense vegetation, ash-laden vegetation was forced over nests making them difficult to find and uncover. Virtually all of the California gulls nested in sparse vegetation, where nests were easy to find. This partially explains why nearly twice as many California as ring-billed gulls excavated their nests.

Burial did not seem to affect the hatchability of the eggs as long as they were completely excavated. The morning after the ashfall I found three ring-billed and two California gull chicks, the first young of the season. The ash apparently had only minor impact on chicks. Had the eruption occurred one or two weeks later, chick mortality probably would have been very high.

During the 1980 season I never saw gulls actually excavating. Therefore,

E. R. DEGGINGER (BRUCE COLEMAN INC.)

Left: fossil bird from the Eocene epoch. Right: two years after eruption, new growth offsets the desolate, ash-covered landscape.

DIGGING FOSSILS

The living world is dynamic and ever-changing. Habitats shift, new species arise, others become extinct. Less than 1 percent of the species which have ever made a debut on our planet are alive today. To understand the history of life we must turn to the geologic record where an impressive, though fragmentary, pageant is preserved in fossil form.

To the frustration of ornithologists, fragile bird bones and eggs disintegrate and rarely fossilize. For want of fossil specimens, we understand less about ancient birds than any other vertebrate group. So when discovered, fossil birds and eggs fill significant gaps in our knowledge of avian ancestry. For example, some researchers have questioned whether the ancestors of ducks resembled shorebirds or grouse. Fossils from Wyoming show that there once lived a bird with a bill like a duck and legs like a shorebird. This evidence suggests that duck forebears were similar to shorebirds. Also, the structure of fossil eggshells may provide clues about the types of habitats used by extinct birds.

Some of the world's finest fossil beds consist of ancient volcanic ash deposits in which fossil birds' eggs occasionally are found. James Hayward and Charles Amlaner felt that some of the nests and eggs buried at the Sprague Lake gull colony after Mount St. Helens erupted in 1980 might have remained intact beneath the ash blanket. If so, the colony could serve as a model to further an understanding of factors influencing egg fossilization. Usually insights into this process are not achieved by direct observation but are inferred by examining the surrounding sediments—a less accurate approach.

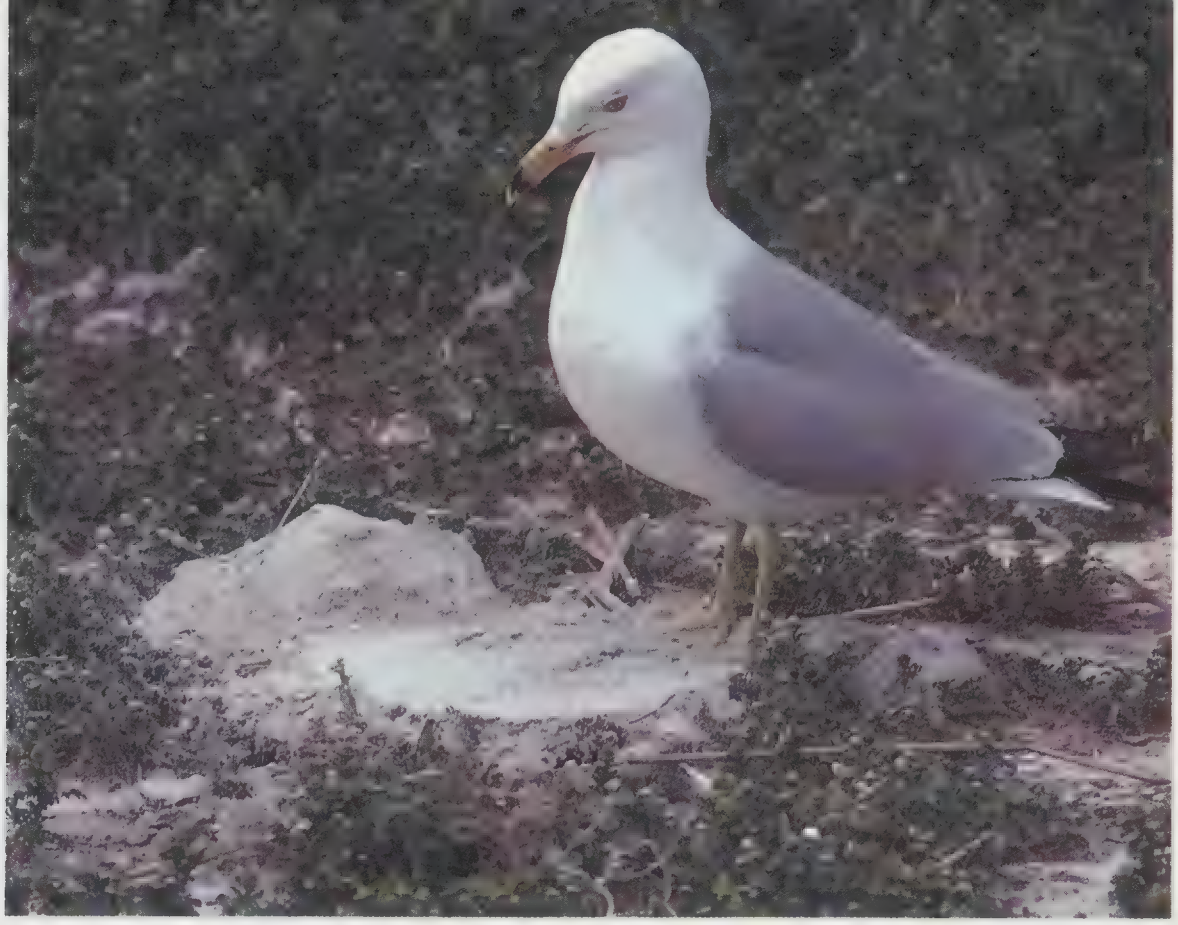
Equipped more like paleontologists than ornithologists, Hayward and Amlaner returned to the colony 14 months following the ashfall. After selecting a promising site, they began to dig for buried nests, eggs and associated materials.

They soon found what they were looking for. Several ash-buried nests contained complete clutches. In some nests preservation was almost perfect, though the eggs were hollow. All preserved eggs and nests found were those of ring-billed gulls. The ash had eroded from higher regions of the colony where California gulls had nested, making preservation unlikely. Most preserved ring-billed gull nests were in lower areas where ash from higher terrain had settled. Future paleontologists might interpret this record to mean no California gulls nested at this colony. This illustrates how inference can be misleading, and underscores the importance of using present-day models as aids in interpreting the past.

In addition to eggs, Hayward and Amlaner found small rodent bones and teeth, the undigestible portions of the gulls' prey. Bird bones, beetle shells and vegetation fragments also were unearthed. Clearly gulls and other predators serve as accumulators of biological material for potential fossilization.

Hayward is continuing his probe into the egg fossilization process. He hopes his experiments will reveal what happens to eggs when they are placed in flowing water, a common transporter of remains before they fossilize. Also, long-term experimental burial of eggs beneath various sediment types may clarify the physical and chemical changes that accompany fossilization.

The eruption of Mount St. Helens, for all its devastation, may help researchers unearth valuable information about the poorly understood process of fossilization.



Ring-billed gull examines its ash-covered nest. Whether or not a gull excavated its nest depended primarily on habitat; buried nests in sparse vegetation were easier to find than nests built among tall or dense vegetation.

JAMES L. HAYWARD

the next year I wanted to discover how this process occurred. Despite my pessimism, the ashfall did not discourage nesting at the colony during the 1981 season. In fact, numbers of nests for both species were close to those of the previous year.

When I returned to the site I selected 15 nests of each species, each with three eggs. To simulate the results of the previous year's ashfall, I deposited one and a quarter inches of clean ash on each nest and recorded the gulls' reactions from a blind some distance away.

The ring-billed gulls responded to the disturbance in an agitated manner. Upon returning to the nest, they spent several minutes wandering around, frequently looking down as if searching for their eggs. The California gulls seemed less confused and proceeded to excavate more directly. Members of both species preened more than usual and arranged bits of vegetation as they do during nest building. These are the same activities the birds engage in when their eggs are removed experimentally from their nests.

Members of both species had two methods of excavation. In one the bird used its breast as a fulcrum while kicking ash back and out of the nest with its feet. By turning, the gull was able to hollow out a bowl-shaped depression containing the eggs. This is the way gulls form depressions for their nests at the start of the breeding season.

In the other, less common method the bird penetrated the ash with its beak and lifted the buried eggs up and back out of the ash. This is the method gulls use to retrieve eggs that roll out of their nests. California gulls used bill digging more frequently than the ring-bills. As I watched from my blind, one California gull got ash in its eye while digging. In response it rubbed its eye on its wing and showed an increase in blinking. Perhaps bill digging was responsible for the conjunctivitis among California gulls I noted after the eruption.

Forty percent of the experimentally covered ring-billed and 80 percent of the California gull nests were excavated, percentages very close to those of the previous year. This gave me confidence that my experimental conditions resembled the real ones.

The Sprague Lake gull colony was not the only one affected by the ashfall. Don Miller at Washington State University, Pullman, visited two other colonies and found that the degree of impact correlated with ash depth. A colony at Banks Lake which received only a quarter of an inch of ash was unaffected. By contrast, a colony at Potholes Reservoir blanketed by three inches of ash had only four ring-billed and 200 California chicks on July 4. Normally thousands of chicks of both species are present on this date.

Virtually all organisms within the area were affected by the ashfall. G. S. Butcher reported that following the ashfall breeding northern orioles disappeared from the Yakima area, 80 miles northeast of the mountain. At Turnbull National Wildlife Refuge, 230 miles from the mountain, duckling production dropped 40 percent. The U. S. Forest Service reported that the entire population of spotted owls in an area just north of Mount St. Helens was wiped out. Certainly countless other birds were destroyed in the immediate blast area.

Insects may have suffered disproportionately compared with other organisms because of their small size and susceptibility to drying up, and since insects are food for many animals, their declines probably influenced populations of numerous other creatures.

However, nature exhibited remarkable resilience in the face of its own destruction and it is doubtful that Washington's wildlife will suffer permanently from the 1980 eruption. Except for the blast area, evidence of the event was barely perceptible one year later.

Volcanoes and other natural catastrophes have punctuated the Earth's history since the first dawn, but we are only beginning to understand how such events influence the biology of non-human organisms.

FURTHER READING

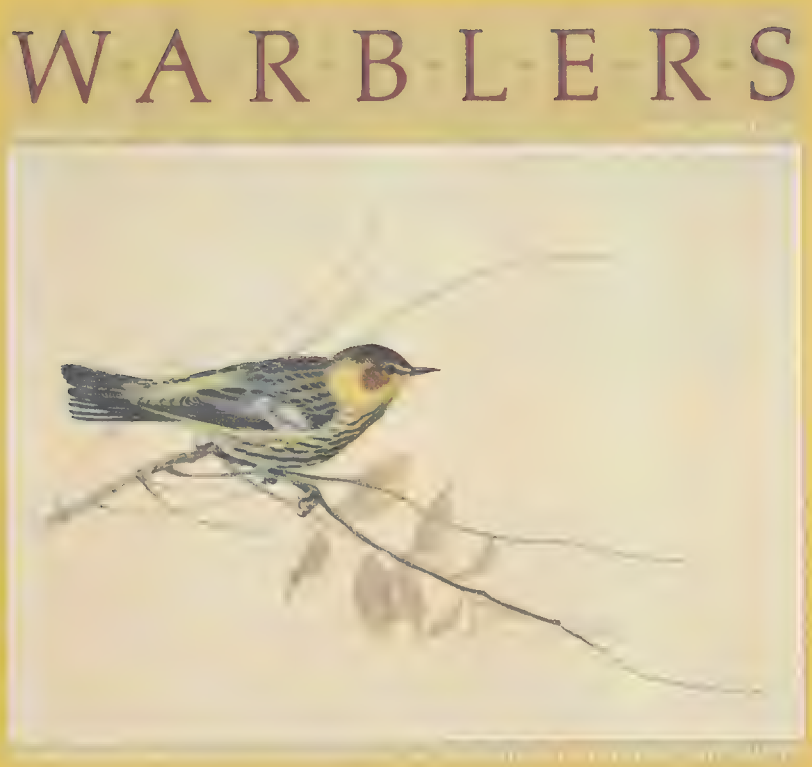
Findley, Rowe. "Mount St. Helens." *National Geographic*. January, 1981.

——— . "The Mountain That Was and Will Be." *National Geographic*. December, 1981.

Hayward, James L., Don E. Miller and Calvin R. Hill. "Mount St. Helens ash: its impact on breeding ring-billed and California gulls." *The Auk*, vol. 99, pp. 623–631.

THE AUTHOR

James Hayward is an associate professor of biology at Union College, Lincoln, Nebraska.



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OH, THEM GOLDEN SLIPPERS

Steven C. Sibley

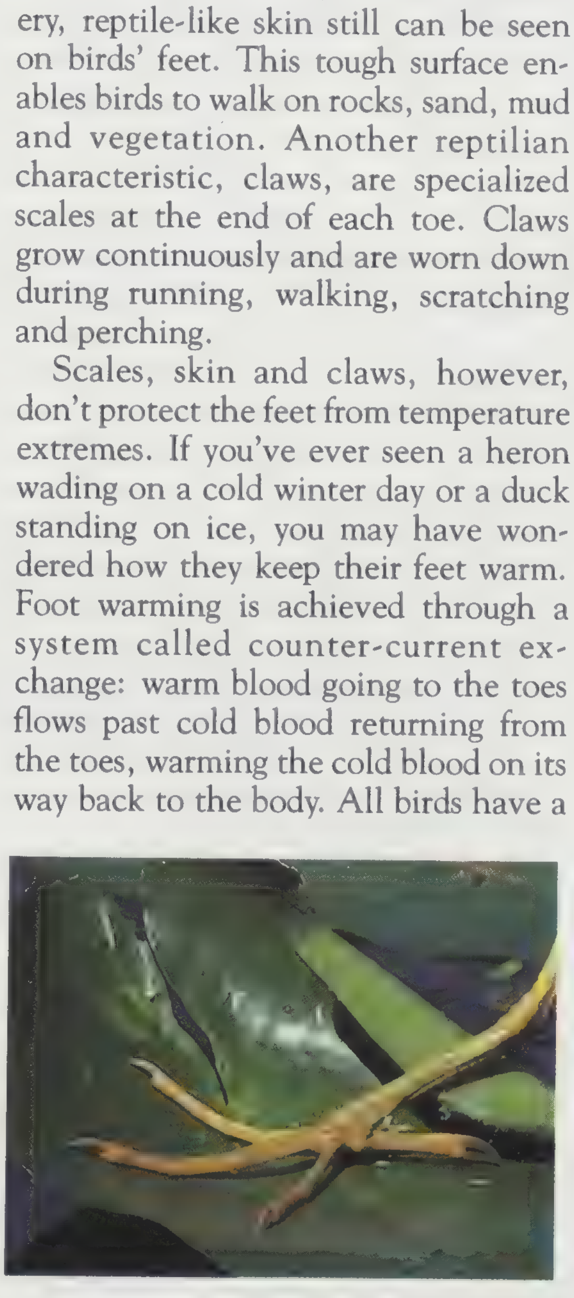
CONSIDER A BIRD'S FOOT: it may be long or short, stout or thin, yellow, green, black or pink. It may be small and weak or large and strong. It may have short, webbed toes, long, thin toes or sharp, curved talons.

The diversity in the shapes, sizes, and colors of bird feet is no accident. Each type represents an adaptation for survival. Just as a finch's strong, stubby bill is designed to open seeds and a falcon's long, pointed wings help the bird overtake its prey, a bird's feet have evolved to help it meet the challenges imposed by its particular way of life.

In some ways all birds' feet are alike; most have four toes and a similar skeletal structure. Surprisingly, nearly all birds stand not on the bottoms of their feet, but on their toes. What looks like the lower leg is the upper part of the foot—corresponding to the human instep—and what looks like a backwards knee is really the heel. On all except long-legged birds such as herons and shorebirds, the true leg is hidden by feathers. Birds' foot bones are fused, as are many other bones in their skeleton, an adaptation that makes them lighter for flight.

Modern birds don't look like the scaly-skinned reptiles they descended from millions of years ago. Most of a bird's skin surface is covered with feathers, which are thought to have evolved from scales. However, scales and leathery, reptile-like skin still can be seen on birds' feet. This tough surface enables birds to walk on rocks, sand, mud and vegetation. Another reptilian characteristic, claws, are specialized scales at the end of each toe. Claws grow continuously and are worn down during running, walking, scratching and perching.

Scales, skin and claws, however, don't protect the feet from temperature extremes. If you've ever seen a heron wading on a cold winter day or a duck standing on ice, you may have wondered how they keep their feet warm. Foot warming is achieved through a system called counter-current exchange: warm blood going to the toes flows past cold blood returning from the toes, warming the cold blood on its way back to the body. All birds have a counter-current heat exchange system, which not only keeps their feet from freezing, but prevents the body from being chilled.



While birds' feet show many similarities, it is the differences that are most apparent. Let's look at some different types of feet and consider how they are adapted for their owners' survival.

The most common type of bird foot is the perching (passerine) foot. Passerines include all songbirds and many other species, such as the common crow. This foot has three toes pointing forward and one backward. All are at the same level and move easily so the bird can grip a branch, twig, or grass stem. Such feet are well-adapted for passerines since they spend much of their time perched in vegetation.

Other birds, including ground-dwellers such as pheasants and turkeys, have the fourth toe raised so it won't get in the way when the bird walks, runs or scratches in the ground while searching for food. Still other birds, such as woodpeckers, have two toes pointing forward and two backward making it easier for them to cling to the surface of a tree trunk.

Bird toes come in all sizes. Some are very short and weak, such as those of the chimney swift, which spends most of its time in the air. Others are quite

Left: snowy egret. Photo by John Shaw. Above: purple gallinule. Photo by John Bova (Photo Researchers, Inc.)

Right: Osprey

long. The purple gallinule has extremely lengthy toes which act as snowshoes, distributing the bird's weight over a large area. This allows a gallinule to walk across lily pads without sinking. Other marshbirds, such as herons and rails, also have elongated toes which keep the birds from sinking into the mud while they feed.

Most swimming birds have webbed toes which help propel the birds through the water. The amount of webbing varies: pelicans have all four toes joined by webbing (totipalmate). Waterfowl—ducks, geese and swans—have three toes joined (palmate). Several shorebirds such as the willet have a small amount of webbing connecting three toes. This type of foot is known as semipalmate, hence the names semipalmated plover and semipalmated sandpiper. Most shorebirds don't swim, but it is possible that ancestral shorebirds did and that the webbing on modern shorebird feet is vestigial. Another variation on webbing is the lobed toes of grebe and coot feet.

Some feet are lethal weapons. The raptors—hawks, eagles, ospreys, falcons, and owls—must kill and eat other animals for sustenance, and their powerful feet and long, curved, needlelike talons are designed for this purpose. Ospreys have a special problem: they eat only fish, so their toes are equipped with spiny scales called spicules which help them grasp wet, slippery prey. Unlike most other raptors, most owls have feathers down to the toes instead of just the ankle. In cold regions, increased feathering aids in heat retention and allows the development of larger muscles and blood vessels in the foot. This is important for northern dwelling species such as the snowy owl, but the reason that southern owls have feathered feet is not known.

Ptarmigan, too, have feathers on their feet. In this case the significance is clear: the feathers grow thickest during the winter and provide insulation and support needed for walking on deep snow. Ruffed grouse have a different adaptation for snow walking. In autumn a row of fringelike scales grows from the sides of each toe, creating a wide surface like that of a snowshoe. The scales fall off in spring.

A few species including barn owls, nightjars, and several herons, have projections called pectinations growing from the outside edges of their middle claws. These projections are permanent and may be useful for combing and cleaning the feathers and the bristles around the beak. There is much disagreement over their exact function, and no one knows why only some species have them.

Most birds' feet are dully colored. However some, such as the mallard's, are brightly colored while others, like the snowy egret's, are two-toned. The mallard's orange feet and the snowy egret's golden slippers probably help the birds identify other members of their species. Bright feet also serve to attract birds of the opposite sex, and many birds' feet change color during the breeding season because of changing hormone levels.

The Earth's plants and animals are constantly evolving in response to the world around them, and birds' feet are no exception. Evolutionary trends which began millions of years ago are evident today and will continue tomorrow. Consider the ostrich, the fastest running bird. As an adaptation for running this species has only two toes, fewer than any other bird. The other two toes were lost through evolution and one of the remaining toes is much smaller than the other. As evolution continues this toe also may disappear. No doubt changes are occurring in other species as well. Perhaps someday in the distant future birds' feet will look entirely different than they do today.

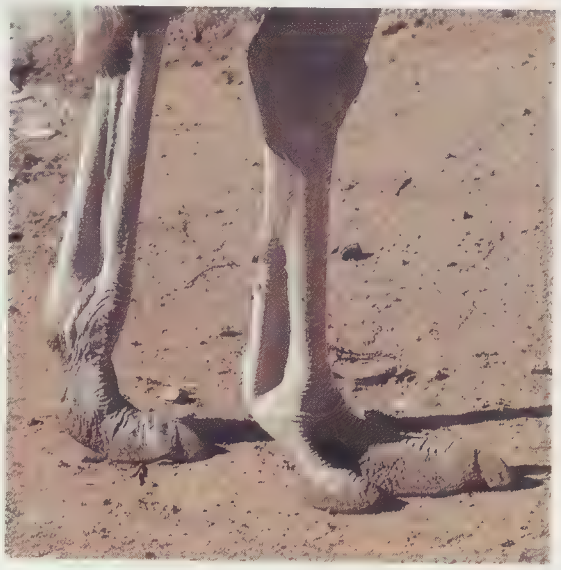
FURTHER READING

Storer, R. W. "Adaptive Radiation of Birds" in *Avian Biology,* Vol. 1. D. S. Farner and J. R. King, eds. Academic Press, New York. 1971.

THE AUTHOR

Steven Sibley is assistant director of public education at the Laboratory of Ornithology.

American crow



Ostrich

Wild turkey

THE BIGGEST

ONE MORNING LAST MARCH the mail brought a large white envelope emblazoned with an invitation: "The New Jersey Audubon Society challenges the best birders in North America to the most outrageous 24 hours in the history of birding." Curious, I opened it and found a letter from Pete Dunne, director of New Jersey Audubon's Cape May Bird Observatory.

"Have you heard about the Biggest Day? It's going to be the world series of birding, the first birding competition. New Jersey Audubon is organizing it and I'm leader of the Cape May Guerrilla team. We hope to break the old New Jersey record by seeing 200 species. Can you bring a team from the Laboratory of Ornithology?"

Now I was really curious. According to Pete, the plan was simple: beginning at midnight, May 19, 1984—the height of spring migration in New Jersey—teams of birders would scour the state in an attempt to locate as many bird species as possible. Twenty-four hours later the teams would converge on the lighthouse at Cape May Point, New Jersey to compare totals. The team with the highest total would be declared winner and would claim the coveted Urner-Stone Cup, named after two eminent New Jersey ornithologists. Because teams from outside New Jersey would be at a disadvantage—they wouldn't be familiar with New Jersey's birding hotspots and would have difficulty doing advance scouting—a separate award would be given for the highest out-of-state total. This was the Ed Stearns Award, named after the man who held the New Jersey Big Day record for more than 30 years.

TIM FITZHARRIS

I finished reading and sat musing. Big Days themselves were not a new concept; birders have been conducting them for years. Reports of big days across the country are published each year in *Birding,* the journal of the American Birding Association. In April 1983 a team of six birders set a new North American record of 235 species in one 24-hour period in California, breaking the previous record of 234 that was set in Texas just one year before. Only one other state had ever broken the 200 mark; a team of two birders saw 202 species in Alabama in April 1983.

But the Cape May Bird Observatory Guerrilla team had been creeping closer to the 200 mark each year. On May 16, 1982 they counted 185 species, shattering the record of 171 that had stood since 1973. On May 14, 1983 they broke their own record with a staggering 194. Now in 1984, with two years of big day experience and one of the world's greatest birders, Roger Tory Peterson, on their team, a 200-species day seemed within reach.

It wouldn't be easy. Even at the height of migration only about 260 species can be found throughout all of New Jersey. And many of these are extremely rare or very secretive. Seeing 200 in 24 hours would require a carefully chosen route, strict adherence to a schedule, advance scouting, good weather, and a large measure of luck.

IRENE HINKE/SACILOTTO

And now the Guerrillas were inviting teams to compete against them, a new twist on the big day concept. Previous big day teams had competed only against their own records. It sounded like fun, but I had some misgivings. I'm neither a bird lister nor a chaser. Would the competitive element ruin the fun of birding?

I looked out the window into an early spring day. It had been a particularly long, cold winter in upstate New York, but finally the tree swallows were returning and I was getting birding fever. I thought about some of New Jersey's great birding spots: Great Swamp National Wildlife Refuge, Brigantine National Wildlife Refuge, Cape May Point. Each alone was worth a trip to New Jersey. All three in one day? It didn't take long to make up my mind.

DAY

The first annual world series of birding: Richard E. Bonney, Jr. leads the Laboratory of Ornithology team into the fray

The evening of May 18 found me rolling toward New Jersey leading the Cornell Laboratory of Ornithology team.

I had three teammates: Andy Dasinger, a Cornell undergraduate; Cricket Smith, an Ithaca schoolteacher and member of the local bird club, and Ed Neumuth, a friend from Washington, Massachusetts. All superb birders, each with complementary strengths.

As we drove we reviewed the rules. Any bird seen or heard counted as long as it was alive and inside the New Jersey state limits. The team had to remain within voice contact at all times except during timeouts when no birds could be counted. We couldn't ask anyone where to find specific birds. Tape-recorded bird calls could not be used to lure birds. And 95 percent of the species counted had to be seen or heard by all team members.

We also plotted our strategy—such as it was. We knew that finding 200 species was impossible for us; our goal was 150. None of us was very familiar with New Jersey. We had a road map, a booklet that described New Jersey's hotspots, and a vague itinerary. We'd begin in the Great Swamp, home of owls and numerous freshwater marshbirds such as rails and bitterns. From there we'd go to the Scherman Wildlife Sanctuary in quest of woodland birds such as warblers and thrushes. Next we'd hit Princeton's Institute Woods for more warblers and Assunpink Wildlife Management Area for grassland birds. Then we would visit New Jersey's birding crown jewel, Brigantine National Wildlife Refuge, to see herons, egrets, gulls, terns, and shorebirds. Finally, we would head toward Cape May for more seabirds and shorebirds.

By 1:30 a.m. we were in the Great Swamp. We had slept for two hours at a friend's house in nearby Millington and left tired but excited. For the next 19 hours we birded nonstop. Particularly memorable moments:

- Traipsing through the Great Swamp in darkness and discovering four other teams. When I hooted a barred owl imitation we wondered how many other teams added the species to their lists.
- Finding 18 species of warblers in 30 minutes at the Scherman Sanctuary.
- Getting lost on our way to Princeton's Institute Woods, then thinking we had found them, getting caught in a downpour, then discovering we were in the wrong place.
- Finding Institute Woods and being rewarded by a mourning warbler—a rare bird—throwing back his head and singing while the sun burned away the rain clouds.
- Finding no grassland species at Assunpink.
- Finding eight species of herons and egrets at Brigantine.
- Finding two red-throated loons, two horned grebes, a black scoter, a lesser scaup, two piping plovers and a flock of purple sandpipers at the Cape May breakwater just as it was getting dark.
- Finishing the day with a total of 168 species, far beyond our expectations.

STEPHEN J. KRASEMANN/DRK PHOTO

How did our 168 stack up? We came in ninth out of 13 teams. The Guerrillas found 201 species and carried off the Urner-Stone Cup. The lowest score was 131. The four teams we beat were all New Jersey teams, but we lost to the only other out-of-state team, Manomet Bird Observatory, which beat us by seven species and returned to Massachusetts with the Stearns Award.

But, as they say in the big leagues, there's always next year. The laid-back approach of 1984 will be replaced by an all-out birding assault. This May we'll bird all 24 hours of the Big Day and follow a carefully prescribed route.

We're losing Ed Neumuth to a new Massachusetts team, but we'll have some new talent, including the Laboratory of Ornithology's assistant director of public education, Steve Sibley, a birder Pete Dunne describes as "awesome."

Our goals? First, to capture the Stearns Award. Second, to give the Guerrillas a scare. We probably can't beat them, but we're sure going to try. Watch for 185 species in '85—weather permitting.

THE AUTHOR

Rick Bonney is associate editor of *The Living Bird Quarterly.*

The American bittern (far left) eluded the big day team, but an equally rare horned grebe (upper left) and red-throated loon (immediate left) appeared at day's end at Cape May Point.

BINOCULARS FOR BIRDERS

Pete Dunne

NO ACTIVITY DEMANDS more from binoculars than birding. They are used on Lac qui Parle, Minnesota, in temperatures of 21 below zero. They're used at Elat, Israel, where the only shade comes from the million raptors migrating overhead. They're used on pelagic trips where the sun throws laser blades into your eyes and salt coats the outside of lenses, and they're used under the tropical canopy at the Asa Wright Nature Center, Trinidad, where sunlight is just a rumor and fungus coats the inside of lenses.

Since World War II, the variety of binoculars in the marketplace has proliferated dramatically. Bushnell, a division of Bausch and Lomb, alone sells over four million binoculars a year and stocks over 60 different models, all geared to specific uses, some not at all suitable for birding.

Consider Bushnell's armored-fog-proof-waterproof glass for yachtsmen. It sheds water like a scotch-guarded scoter, may be drop-kicked against a bulkhead and probably could straighten a bent propeller. But its gargantuan size and shape and individual eyepiece focusing make it as deft as a pipefitter's wrench. Or take the Zeiss 10×25 pocket mini-binoculars. Their light weight and small size make them ideal for backpackers or concert goers but the compromises made to get them down to Lilliputian size lessen their value to birders. This is not to say that the Bausch and Lomb marine glasses and the Zeiss minis are not good binoculars; they're just not right for birding.

Several important factors must be considered when choosing a pair of binoculars for bird watching. Some considerations weigh more heavily than others and different individuals will assess the relative importance of each factor differently.

Magnification, usually called "power," is a measure of how close a bird will appear and what details will be seen. Binoculars can range in power from 2×, for viewing the opera, to 80×, for watching tanks from a safe distance. The power is etched on binoculars as the first part of a two-number formula: 6×30, 7×35, etc. Binoculars most popular with birders range from 7× to 10×: a seven power binocular will make a perched loggerhead shrike appear seven times closer than it really is; a 10 power binocular will make it appear 10 times closer.

In theory, the higher the magnification, the easier it is to identify distant birds. This is the line of reasoning that prompts the neophyte to buy high-powered 15× or 20× binoculars. But higher powers don't just magnify the image, they magnify hand tremor and distortion caused by heat waves rising from land or water. What is gained in magnification is lost to image vibration. Increased magnification also reduces field of view—the area visible through a pair of binoculars.

Forty years ago, 7× binoculars were

PHILIP JONES GRIFFITHS (MAGNUM)

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When a new pair of binoculars falls into my hands priority one becomes throwing away those ridiculous stoppers

the standard in birding circles. The wisdom of the day held that higher powers were suited only for special forms of birding like hawk watching or shorebirding. Today, serious birders give the nod to 8×, 9× and particularly 10× binoculars. The move toward higher magnification is not because hands shake less now than they did 50 years ago. Rather, change has occurred in binoculars themselves.

In the early '60s, slim, light roof-prism binoculars began to appear in the hands of serious birders, replacing traditional porro-prism binoculars. The popularity of the roof-prisms increased through the '70s, until Leitz and Zeiss roof-prisms became standards against which other binoculars were measured. One of the big plusses of roof-prisms is that they can be held steadier than their porro-prism counterparts. Porro-prisms raise the elbows up and away from the body. Arms and shoulders tire quickly and begin to tremble, thus producing a shaky image. Most birders cradle roof-prism glasses by overlapping their hands. Elbows are held more firmly in front of the body which results in less fatigue.

Birding also has changed. Field identification has become more refined, a trend that has taken the concept of field marks from macro- (wing bars and tail spots) to micro-scale (feather edges and buffy fringe). In 1948 if a birder wanted to identify a dowitcher, his Peterson field guide tutored that the bird could be recognized by "the very long straight, snipe-like bill and white lower back, rump and tail." In 1985 the same birder wishing to distinguish juvenile short-billed dowitcher from juvenile long-billed dowitcher would look for "back and scapular feathers [that] have reddish-buff edges; tertials [that] are similar with reddish-buff internal markings . . . " as the National Geographic Society's field guide points out. The new lighter weight binocular designs make higher magnification possible and the trend to more detailed field marks makes it desirable.

Brightness. An image must be bright as well as large. The amount of light that a binocular transmits depends to a large extent upon the size of the objective lenses—the two lenses which are closer to the object being viewed—denoted by the second number in the two-number formula. The number refers to the diameter of the objective lens in millimeters—a pair of 7×50 binoculars has an objective lens 50 millimeters in diameter. Generally speaking, the larger the objective lens, the greater its light-gathering capacity.

As with magnification, the concept of brightness often confuses the uninitiated because they assume that bigger is better. This would be true if all birding consisted of looking for owls and nightjars. Most of the time, though, birders don't need nearly as much light as binoculars with high brightness provide.

Besides the size of the objective lens, another factor influencing brightness is lens coating. Approximately 5 percent of the light traveling through a pair of binoculars is lost each time it strikes an uncoated lens surface. Since there are usually 12 surfaces, the loss adds up. Coated lenses, which lose only 1 percent or less of light to reflection, can increase the overall brightness of a pair of binoculars by 50 percent over those with untreated lenses. The better manufacturers coat all lens surfaces. Lenses with multiple coatings are superior to those which have only a single layer. Roof-prism lenses backed with silver coating outperform those that are aluminized. It is now possible to find 8×30 binoculars that appear as bright as some 8×40s.

Sophisticated coatings have even closed the gap between the roof-prism and porro-prism glasses. The intricate optical path that makes the space saving roof-prism design possible requires additional lenses and reflecting surfaces, resulting in potentially greater loss of light. Were it not for the advances in lens coating, there would be a lot fewer roof-prism binoculars in the hands of birders.

Optical Quality. This is a tough characteristic to judge, since differences in the higher grades of binoculars are small. However, some binoculars that cost less than $50 are obviously inferior, showing rainbow rings of color at the edge of the field or distortions that make you think the world is melting at the horizon. Too often, though, the defects are not obvious and eye fatigue will be the first indication to a new owner that his bargain binos weren't such a bargain after all. If you find you are increasingly reluctant to use your binoculars as the day progresses, it just might be because of bi-

Quality binoculars are essential for identifying similar-appearing birds such as semipalmated sandpiper (below) and least sandpiper (right).

WAYNE LANKINEN

nocular-induced eye strain.

The image you see in your binoculars should be clean, sharp and distortion-free. To test for image sharpness, focus your binoculars on a pattern of parallel lines—a brick wall, a chain-link fence. If the lines bend, blur or thicken irregularly, your lenses are not up to snuff. Some modest distortion at the edge of the binocular field is permissible. An absolutely flat field is accomplished only at the expense of a sharp image at the center. Therefore many manufacturers, choosing not to compromise, will accept a modest distortion at the edge.

As far as high-quality optics go, there is a simple rule of thumb: you get what you pay for. If you buy binoculars listing in the $150–$200 range you can assume you'll get satisfactory optics.

Field of view relates to the amount of area visible through a stationary glass. For birding purposes, an adequate field is a must. A large field makes it easier to find birds at close quarters in deep woods, and unusual or different species in an otherwise homogeneous flock. It is invaluable for the hawk watcher who spends hours scanning the sky and to the pelagic birder who must make quick pick ups on fast-receding birds while the world moves underfoot.

Field of view usually is expressed as the horizontal distance visible 1,000 yards from the viewer. I wouldn't recommend a field that falls short of 300 feet at 1,000 yards. Most models offered by the highly regarded manufacturers surpass this minimum standard.

It also pays to be leery of binoculars that claim to be super-wide angle. They may offer a grandiose vista at the price of a clear image. The binoculars that rated highest in this category had fields that ranged from 340 to 350 feet.

Eye relief. Most binoculars are fitted with eyepieces that automatically place the user's eye at the proper distance from the lens. But eyeglass wearers have a special problem since eyeglasses increase the distance between the eye and the ocular lens and cause a drastic reduction in the field of view. Some brands, such as the Leitz Trinovid, offer a good field for eyeglass wearers.

Today almost all binoculars come with fold-down rubber eyecups that help to alleviate this difficulty. The eyecups may be folded back to bring the eyeglass wearer's eyes closer to the ocular lens. Even if you don't wear glasses, rubber eyecups are more comfortable than metal or plastic, despite the fact that eventually they will wear out and need to be replaced.

Some old-time birders insist that proper birding can be accomplished only by wielding a hefty chunk of glass

Close Focus. Among the activities that need binoculars, only birding requires that close objects be brought into focus. Birds often are obscured by heavy cover at close quarters or by bad lighting that makes seeing field marks with the unaided eye impossible. Binoculars that cannot focus closer than 10 or 12 feet lose points in the eyes of birders.

Ease of handling. A birder's binocular is like a frontiersman's ax or a first baseman's glove. It gains a familiarity that transcends thought or effort; it becomes a part of you. What is suitable for one birder may not be suitable for another, but some considerations are universal.

Large or bulky binoculars are unsuitable for small hands. If you have to shift your grip to focus, then the glass is not for you. When your finger does not rest automatically on the focus knob, the binocular is too large or ill designed. If your fingers get tangled up or hang off the edge, or if handling the binoculars gives you the impression you are holding a Boehm miniature, then they are too small. If you nearly break your frontal bone every time you throw the glasses up to your eye, then the ocular lens is too large; the eyepiece should fit comfortably in the orbit of the eye.

Weight. Some old-time birders insist that proper birding can be accomplished only by wielding a hefty chunk of glass. This premise rests on the belief that a heavier glass can be held steadier than a light one, particularly in the wind.

Actually, the opposite is true. Lighter binoculars can be held for longer periods without the strain that sets the hands to trembling. Since birders usually wear binoculars suspended from straps around their necks, lighter binoculars can be worn for longer periods and with greater comfort.

Roof-prism glasses are half the weight of a comparable pair of porro-prisms. The optimal weight in the opinion of our testers was a pound to a pound and a half.

Focusing. Binoculars suitable for birding should have center focus—a single focus wheel that controls both barrels. There also should be an individual eyepiece adjustment to compensate mechanically for the normal differences between an individual's eyes.

The amount of play (how much the focusing mechanism must be moved to

WAYNE LANKINEN (BRUCE COLEMAN INC.)

Brand and Model	Overall Rating	Retail Price	Roof-prism Porro-prism	Optical Performance	Minimum Focusing Distance	Field of View	Water Resistance	Comfort, Feel, Handling	Weight	Ease of Focusing	Quality and Workmansh	dvantages	Disadvantages	Comments
Zeiss Dialyte 10×40 B	🟥	$842	RP–A	🟥	🟦*	🟪	+	🟥	🟦	🟥	🟥	1	A, B	max. focus distance = 208 ft.; 1 lb. 10 oz.
Nikon 8×30 WF	🟥	388	PP	🟦	🟪	🟥	+	🟪	🟥	🟥	🟪	2, 11	C, D	1 lb. 4 oz.
Nikon 9×30	🟪	412	RP	🟦	🟪	🟦	+	🟥	🟦	🟦	🟪		A, E	1 lb.
Bausch and Lomb 10×28	🟪	334	PP	🟥	🟥	⬛	+	🟦	🟦	🟥	🟦	3	F	max. focus distance = 206 ft.; min. focus distance = 6.6 ft.; 14 oz.
Bausch and Lomb 8×24	🟪	312	PP	🟪	🟥	🟦	+	🟦	🟦	🟪	🟦	4		min. focus distance = 5.1 ft.; 14 oz.
Nikon 8×35	🟦	187	PP	🟪	🟪	🟦	–	🟪	🟥	🟦	🟪	5	G	1 lb.
Leitz Trinovid 8×40 BA	🟦	924	RP–A	🟦	⬜	🟥	+	🟦	🟪	⬜	🟪	6, 11	H	1 lb. 5 oz.
Bausch and Lomb 9×35	🟦	370	PP	🟪	🟪	⬜	✓	🟪	🟦	🟪	🟦	7	I	1 lb. 8 oz.
Leitz Trinovid 10×40 B	🟦	897	RP	🟥	⬛	⬛	+	🟥	🟪	⬜	🟪			max. focus distance = 200 ft.; min. focus distance = 18.7 ft.; 1 lb. 3 oz.
Bausch and Lomb 7×24	🟦	312	PP–A	⬜	🟥	🟪	+	🟦	🟦	🟦	🟦		J	min. focus distance = 5 ft.; 1 lb.
Bausch and Lomb 10×50	⬜	380	PP	🟪	⬜	⬜	+	⬛	⬛	🟦	🟦			2 lbs. 12 oz.
Swift Trilyte 8×40	⬜	192	RP	⬜	⬛	⬜	+	🟦	🟥	🟦	⬛	8, 9		min. focus distance = 15.8 ft.; 1 lb. 4 oz.
Swift Osprey 7.5×42	⬜	190	PP–A	⬜	🟪	🟦	+	⬜	⬜	⬜	⬛	10		1 lb. 12 oz.
Swift Audubon 8.5×44	⬜	240	PP	🟪	🟥	🟥	–	⬛	⬜	⬛	⬛	11		min. focus distance = 7 ft.; 2 lbs. 3 oz.
Bushnell Explorer II 8×40	⬜	196	PP	🟦	🟦	⬜	✓	⬜	🟦	🟦	⬛		D	2 lbs.
Bushnell Explorer II 10×50	⬜	202	PP	🟪	⬛	⬜	–	⬛	⬜	🟦	⬜			2 lbs. 4 oz.
Nikon 7×50	⬜	423	PP	⬜	🟦	🟪	✓	⬛	⬜	⬜	⬜		K	2 lbs. 6 oz.
Bausch and Lomb 7×50 Marine	⬛	470	PP–A	⬜	⬜	🟦	+	⬛	⬛	⬛	⬜		L	3 lbs. 6 oz.

*factory modified for close focus A—armored

Key to Advantages

1. Repair turnover time excellent.
2. Rated as best buy.
3. Very light, very compact.
4. Much better field than 10×, brighter image.
5. Image brighter than 8×30.
6. Good for eyeglass wearers.
7. Very bright, sharp image.
8. Easy to hold and handle.
9. Repair turnover time excellent.
10. Serviceable and moderately priced.
11. Field of view ∼ 350 ft. at 1,000 yds.

Key to Disadvantages

A. Objective lens scratch prone.
B. Image distortion at edge of field.
C. Image darker than Zeiss 10×40B.
D. Repair turnover time poor.
E. Image very dark.
F. Field of view very narrow.
G. Poor depth of field.
H. Focus wheel stiff and requires too many revolutions.
I. Focus wheel requires too many revolutions.
J. Armor increases weight significantly.
K. Focus mechanism very stiff.
L. Not designed for birding.

🟥	Excellent	+	no fogging
🟪	Very Good	✓	partial fogging
🟦	Good	–	severe fogging
⬜	Fair		
⬛	Poor		

bring the subject into focus) appropriate for birding is debatable. Binoculars with a very critical focus, where the wheel barely needs to be turned, have the advantage of focusing quickly, but may sacrifice depth of field. They are quick to be in focus and quick to be out of focus. Binoculars that have a broad range of focus give terrific depth of field but sacrifice speed. Precious seconds are lost spinning a focus wheel—and warblers in deep woods tend to be an impatient lot. The binoculars that rated highest in the eyes of our testers took the middle ground, having a full focusing range within three quarters to one and a quarter spins of the wheel.

How much a focus mechanism moves is only slightly more important than how well. It should move smoothly, cleanly, without jerks, skips, mushiness, or stiffness, and it should be responsive no matter how hot or cold the conditions.

Other considerations. The moment binoculars are taken out of the case, the outside is trying to get inside the mechanism. Ideally, a pair of binoculars should be waterproof, moistureproof, and dustproof. A binocular that fogs up or retains water ceases to be an ally.

When binoculars are focused, they act like a bellows, pulling in air, moisture, dust, and pollen. Good binoculars are sealed, some better than others. Leitz and Zeiss roof-prisms are famous for their weather-resistant qualities. Some pelagic birders have been known to hold their Zeiss armored binoculars under the tap to remove a day's accumulation of salt. But time and hard use master even the best. My own pair of Leitz 8×40 are prone to fogging now, after 10 years of hard use. Roof-prisms, with their internal focusing, tend to be more waterproof than the external-focusing porro-prisms.

Pampering equipment is not something that comes naturally to me. When a new pair of binoculars falls into my hands priority one becomes throwing away those ridiculous stoppers that plug up both ends of the barrels. The glasses will never see the inside of a case again. When not in use 10 hours a day at the hawk watch absorbing a prodigious amount of dinging and banging, they will be chucked under the front seat of a car with assorted small change and coffee cups or will share the back seat with an eclectic array of hardware. They will be dropped into sand, doused in salt-marsh creeks, and loaned to birding friends who are unburdened by the responsibilities of ownership.

Armored binoculars are not essential, but some rubber armoring on the objective end should serve for all but the worst calamities. It is safe to say that the average roof-prism binocular will take more punishment than the average porro-prism because of the differences in the internal design.

Another protective feature is desirable—a recessed objective lens. Recessed lenses are less prone to being scratched. Another useful item is a rubber rain guard that fits over the ocular lenses. You're from Arizona and aren't concerned about rain? Rain guards also keep out dirt and blobs of mayonnaise that may accumulate on lenses.

Binocular straps are taken for granted until that fateful day when they and the binoculars part company. Leather straps are supple and chic but the effects of sweat and friction take their toll. Plastic straps seem to have a will of their own in low temperatures, contorting into loops that end up in mouth or eye. Recently, straps made of braided synthetic fiber have become standard issue on many of the better brands including Bausch and Lomb, Nikon, and Leitz. They are durable, fray resistant and seem suited to hard field use.

Some owners of heavy binoculars, hoping to spread the weight around, replace their stock neck strap with a wider camera strap. Be mindful of one thing: many of these straps use metal clips. The attachment points on binoculars are made of metal and this contact creates friction that ultimately will wear out the clips. Gravity is a force to be reckoned with.

The Tests. We took a look at some of the more popular brands and models of binoculars to see how they stacked up to birder standards. Binoculars were borrowed from Bushnell (a division of Bausch and Lomb), E. Leitz, Inc., Nikon, Inc., Swift Instruments, Inc., and Zeiss, Inc. Why these brands? They seem to be the ones found in the hands of most birders and are those owned by most of the 29 birders who made up our test group. There are other fine binoculars we did not test, some of which may have done better than those tested. These omissions were not by design.

As you can see from the chart, 18 pairs of binoculars were tested and evaluated. Each pair was subjected to quantitative tests: optical performance, minimum focusing distance, field of view, and water resistance; and qualitative evaluation: weight, comfort, feel, ease of handling, ease of focusing, overall sense of quality, workmanship, and ruggedness.

The optical performance (maximum focusing) and minimum focusing tests used targets spaced at 10-foot intervals, each target bearing various combinations of the letter "E" facing up, down, left or right. Optical performance was measured in terms of the most distant letters which could be read by the test group with each pair of binoculars; minimum focusing distance was measured in terms of the closest which could be read.

Water resistance was tested by placing all 18 pairs of binoculars under a lawn sprinkler until soaked. They were shaken to remove excess water and the focus mechanism was worked vigorously. Following this, they were placed in a refrigerator for two hours so that any moisture that may have leaked inside the barrels could condense and fog the lenses.

The binoculars were then scored and rated against each other. The scores were translated into easy-to-read squares of dark red (excellent), light red (very good), dark blue (good), light blue (fair), or black (poor). For the overall rating, each category was regarded to be of equal importance.

THE AUTHOR

Pete Dunne is director of New Jersey Audubon's Cape May Bird Observatory, Cape May Point, New Jersey.

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RESEARCH & REVIEW

Richard E. Bonney, Jr.

LEAD vs. STEEL SHOT

During the past eight years more than 100 studies have been conducted on the subject of lead poisoning in waterfowl. Why so many? Because the lead poisoning problem and attempted solutions have become a highly controversial issue.

The problem: each year waterfowl hunters expend 3,000 tons of lead shot. The lead pellets that miss their mark end up at the bottom of marshes and shallow ponds or in open fields. Waterfowl—especially dabbling ducks such as mallards and pintails—ingest the pellets mistaking them for food. The lead is absorbed into the bloodstream and as the concentration increases, the birds become anemic and unable to fly. As their muscles waste away and their vision deteriorates, they seek seclusion. Eventually they die, either directly from the poisoning or because their weakened condition causes them to succumb to starvation, disease or predation.

The severity of the problem varies depending upon how heavily an area is hunted and a variety of physical factors. Nevertheless, a single pellet can kill a bird, and the U.S. Fish and Wildlife Service (FWS) estimates that between two and three million ducks and geese are poisoned by lead shot each year—about 3 percent of the total population. Some biologists feel this is an underestimate.

The problem is not confined to waterfowl. Studies have documented lead shot ingestion in several other species including pheasants, godwits, and bobwhite quails. Also, predators that eat poisoned waterfowl can become poisoned themselves.

The solution: require hunters to use steel instead of lead shot. Steel is nontoxic. The problem wouldn't vanish overnight because there are tons of lead already in the environment. However, gradually the problem would diminish in most areas.

The controversy: many hunters oppose conversion from lead to steel shot. Some argue that because of its lighter weight and alleged ballistic inferiority, steel shot cripples more birds than lead. Others feel that steel shot damages firearms. Still others complain that steel is too expensive. However, studies made by several independent researchers have shown that crippling rates are increased only slightly if at all by steel, and that damage to shotgun barrels has been overestimated.

In 1976 FWS weighed the facts and began instituting steel shot hunting zones where lead shot was prohibited, and developing education programs about the use of steel shot. Soon after, several states began requiring hunters to use steel. Despite opposition from hunters, the regulations stood up to two federal court and three state court challenges. It seemed that we were on our way to solving the problem.

Under the Reagan administration, however, the federal steel shot program stalled. Assistant Secretary of the Interior G. Ray Arnett described the federal steel shot program as a "waste of money" and claimed that FWS overstated the problem and doesn't know "diddilium" about reality. Interior officials forced managers of national wildlife refuges to back off programs requiring use of steel shot on refuges. Information on waterfowl die-offs due to lead poisoning was suppressed and FWS terminated lead-steel shot research and directed the states to solve the problem themselves.

A new twist: the federal government may choose to ignore the deaths of two to three million waterfowl annually, but may not be able to disregard the effects of lead shot on the bald eagle, an endangered species. The National Wildlife Federation (NWF) has been studying this problem in detail and believes that at least 70 bald eagles have died from lead poisoning since 1966. Two NWF biologists, J. Scott Feierabend and Orrin Myers, prepared a national summary of lead poisoning in bald eagles and identified 95 counties where the risk of lead poisoning in bald eagles is particularly high. On August 1, 1984 NWF petitioned to establish steel shot zones in these counties for the 1984–85 hunting season. The FWS took no action for 1984–85, but is considering designating steel shot zones in five counties where the problem is considered most critical during the 1985–86 season. Two counties are in California, two are in Oregon, and one is in Missouri. Also, FWS is reviewing data for the remaining counties and may designate some of them as steel shot zones.

Feierabend is pleased that FWS is again taking action toward eliminating the use of lead shot. However, he feels this is just a first step and notes that NWF will continue to press until lead shot is banned. Much of the research done in the last eight years is summarized in a booklet that Feierabend recently prepared, *Steel Shot and Lead Poisoning in Waterfowl* (NWF Scientific and Technical Series 8). This is an annotated bibliography of research published between 1976 and 1983 and is available for $4.95 plus $1.55 shipping from National Wildlife Federation, 1412 16th Street, N.W., Washington, D.C. 20036. Feierabend also invites people interested in learning more about the issue to write to him at the above address or call him at (202) 797-6833.

PEEKING

Wild birds lead difficult lives. They face a constant struggle to find food without becoming food. Escaping predators is hard enough while a bird is awake. How does it manage while asleep?

Different types of birds respond to this problem in different ways. Some sleeping birds try to hide from predators: warblers sleep in dense vegetation, woodpeckers roost in deep holes in trees, and many shorebirds sleep in large flocks where the probability of an individual being singled out is low.

Sleeping birds also may try to detect predators. Pairs of pink-footed geese take turns keeping watch while their mates sleep. Some members of goldeneye flocks stay awake while their flockmates sleep. Researchers also have noted that sleeping birds occasionally open their eyes without fully awakening, and Dennis Lendrem of the Animal Behaviour Research Group, Oxford, England, believes that "peeking" is another method of predator detection ("Sleeping and vigilance in birds. I. Field observations of the mallard." *Animal Behaviour,* vol. 31, pp. 532–538).

Lendrem studied peeking behavior in a flock of mallards sleeping near a jetty in Oxford. He discovered that peeking rates were highly variable, ranging from one to 24 peeks per minute, and that a bird's peeking rate seemed to change in response to the bird's susceptibility to predation.

First, peeking rates were greatest for birds that were close to shore and lowest for birds farthest from shore. This is probably because ducks sleeping close to shore are in greatest danger from land-based predators such as humans and cats. Second, birds decreased their peeking rates as the number of birds between their resting place and the shore increased, presumably because the intervening birds are a buffer against danger. Third, males peeked more often than females during the breeding season when the males were brightly colored and conspicuous; several studies have shown that brightly colored prey are more susceptible to predation than dull-colored prey. After the breeding season, when the males acquired their drab, eclipse plumage, peeking rates of males and females were about the same.

Very little is known about the mechanics of bird sleep, but most researchers believe that peeking rates are a measure of how deeply a bird is sleeping. This study shows that peeking rates of mallard ducks are not random. Therefore it seems likely that mallards, and probably other birds as well, can adjust their levels of sleep in response to changing danger levels.

DIGGING WORMS

If you've ever dug earthworms, you know how hard it can be to find them. They are not evenly distributed throughout the ground but are found only in soils having specific temperature ranges and moisture contents.

This poses a challenge for the American woodcock, a species that feeds almost entirely on earthworms. The bird's long bill allows it to probe easily, but how does it know where to dig? Dale Rabe, Harold Prince and Donald Beaver of Michigan State University have studied this question with six captive woodcocks ("Feeding-site selection and foraging strategies of American woodcock," *The Auk,* vol. 100, pp. 711–716).

The researchers began their experiments by placing each bird in a cage containing trays filled with different soil types. Then they recorded the amount of time the birds spent probing in each tray. They found that the birds made 94 percent of their probes into loam and sandy loam, soils which, in nature, are rich in earthworms. The birds avoided sand and clay loam, soils which naturally contain few earthworms. It seemed like the birds could distinguish between soils and could determine which should be most rewarding. But how?

Rabe, Prince and Beaver conducted several more experiments using trays filled with soils of differing moisture levels and textures. They discovered that the birds used neither of these cues. Instead, they selected foraging sites on the basis of soil color, preferring dark soils to light ones. This may seem surprising, however, the researchers note that wet soils, which usually contain numerous earthworms, tend to be dark in color. Also, dark soils contain a lot of organic matter, an important food source for worms. Therefore, dark soil color could well be an indication of earthworm abundance.

Yet reliance on color may cause birds to forage in unproductive areas: one researcher saw woodcocks probing in dried-up mud puddles where there was a dark layer of silt but no worms. Reliance on color also might cause birds to overlook light-colored areas that do contain worms. Wouldn't soil temperature or moisture content be better indicators of earthworm abundance?

They probably would. However, considering that wild animals always try to conserve energy, Rabe, Prince and Beaver speculate why woodcocks have evolved to rely on color. First, by observing color, the birds need to monitor only one characteristic that gives them fairly reliable information about a soil's worm content. Second, the birds probably evaluate soil color quickly; their foraging endeavors would take much longer if they had to probe every new area to test soil texture and moisture. By using color, woodcocks may even be able to evaluate feeding sites from the air.

Dabbling ducks such as mallards ingest lead shot while tipping up to feed in bottom mud.

WAYNE LANKINEN (BRUCE COLEMAN INC.)

NEW WARBLER BOOK

Warbler watchers will be interested in a new book by Hal H. Harrison, *Wood Warblers' World* (1984. Simon and Schuster, New York. 335 pages. $19.95, cloth). Harrison has authored two guides to birds' nests in the Peterson field guide series and has studied warblers and their nesting behavior for over 30 years.

Wood Warblers' World begins with a short introduction that discusses the biology and conservation of these tiny, colorful, often elusive birds. The rest of the book comprises individual accounts of the 53 wood warblers that nest in the United States and Canada. The accounts contain information on a species' behavior, breeding range, habitat preference, nesting biology and song. Most species are illustrated with color and black-and-white photographs, and additional black-and-white photos illustrate the birds' nests and nesting habitat. Range maps, which depict each species' nesting distribution, are included.

Unfortunately, the book is a disappointment. The species accounts are too short and erratic: they concentrate on nesting biology, Harrison's specialty, but often exclude other information, such as feeding habits, population status, migration patterns and winter ecology. The introduction is particularly shallow; several important topics are introduced but poorly discussed, such as the effects of tropical deforestation on wood warbler populations. Much of the writing is anecdotal, but many of the anecdotes are superfluous and rambling. Consequently, the book is neither a good reference nor a natural history narrative.

Contrary to the dust jacket claim, *Wood Warblers' World* is not the most comprehensive book on the subject ever published. *The Warblers of America,* edited by Ludlow Griscom and Alexander Sprunt, Jr. in 1957, and revised and slightly updated by Edgar M. Reilly, Jr. in 1979 (Doubleday and Company, New York), is at least as comprehensive and, except for its poor illustrations, a more useful book. However, it is out of print.

Wood Warblers' World is not a definitive work on the life histories of North American wood warblers. However, it is the only book available and it does include some interesting information on warbler nesting biology. The photographs are very good and those of the birds' nesting habitat are unique; the bibliography also is useful.

NEWS & NOTES

Compiled by Steven C. Sibley

LABORATORY SUMMER COURSES

Join us in June for two new Laboratory-sponsored field courses. Our classroom will be Cornell's 4,000-acre Arnot Forest, near Ithaca, New York, summer home for nearly 80 species of eastern birds, including ravens, red-shouldered hawks, and barred owls.

Field Ornithology will be offered June 9–15, 1985. Hone your skills of bird observation and identification through the integration of field marks, song, and habitat cues. Lectures and discussions led by Laboratory staff will emphasize principles of animal behavior and ecology which can be applied to the study of birds anywhere in the world.

Nature Photography will be offered June 16–22. Tim Fitzharris, distinguished nature photographer, will be your instructor during part of the course. Many aspects of natural history photography will be discussed, from birds at the nest to close-ups of flowers, insects, and aquatic creatures. Free time will be available for students to take pictures, which will be processed and critiqued the same day.

Each course is $325, which covers all costs, including food, lodging, class materials and instruction fees from Sunday evening through Saturday morning. Enrollment is limited and on a first-come, first-served basis, so sign up by March 1, 1985. A nonrefundable deposit of $50 for each course will reserve your space. VISA or MasterCard accepted. To place your reservation or for more information call (607) 256-8551 (Monday, Wednesday or Friday only) or write Summer Courses, Laboratory of Ornithology, Cornell University, Sapsucker Woods, Ithaca, New York 14850. See inside front wrapper for enrollment application.

THE U.S. FISH and Wildlife Service has placed restrictions on the 1984–85 black duck harvest in hopes of preventing further declines in the species' population. Restrictions include reduced bag limits and modified hunting season dates. Canadian and federal and state agencies in the U.S. are implementing restrictions after several states voluntarily reduced bag limits last year. The North American black duck harvest decreased from 572,000 in 1982 to 523,000 in 1983, continuing the 1 to 2 percent annual decline in harvest which has occurred for more than 30 years.

In response to concern over black duck populations the Laboratory's Cooperative Research Program was awarded a grant by the U.S. Fish and Wildlife Service to study this issue in North America. We will be examining the species' winter population trends over the past 35 years using Christmas bird count data to determine the extent of the decline. Black duck-mallard population dynamics will be an important aspect of this study since some authorities suggest that hybridization between mallards and black ducks may be swamping black duck populations.

Gregory S. Butcher has been named acting director of the Laboratory's Cooperative Research Program. Besides the black duck study he will be pursuing several other new projects in addition to working with the Colonial Bird Register and Nest Record Program. He replaces Donald McCrimmon who became executive director of the Point Reyes Bird Observatory in California last October.

THE BRITISH TRUST for Ornithology newsletter has reported serious population declines in some of Britain's breeding birds. The reason for the declines are found not in Britain, but 2,000 miles south in the African Sahara. Widespread drought has greatly affected bird populations that spend the winter there. Sand martins, redstarts, sedge warblers, whitethroats, and yellow wagtails are hardest hit, with most of these species experiencing a 20 to 70 percent decline from 1983 to 1984. These figures parallel declines in these insect-eating birds recorded in 1969 after several years of drought in the Sahara.

Dear Member:

Bird watching must be fun. Why else would so many people endure hordes of blackflies while looking for spring warblers? Or stand on a lurching ship scanning the horizon for seabirds? Or pull themselves out of bed on a frosty morning to search for winter waterfowl? Watching birds adds dimension to a walk in the woods and, like fishing or hunting, offers a good excuse for ignoring the household chores.

For some folks, birding is also a competitive sport. How many species of birds can you see in one day? In one year? How many in each state? In each county? This kind of birding is not only fun but can lead to new knowledge about bird distributions.

Those of us who study birds as a profession get enjoyment from them, too. I get a thrill when I see some new aspect of bird behavior, or when I design an experiment with homing pigeons and the birds give me an answer to my questions.

At the Laboratory, we're dedicated to perpetuating birding as fun, education, sport, and as a means of furthering the science of ornithology. For instance, our new warbler record can help you identify the complex songs of these elusive and confusing birds. Our photographic collection can help you prepare a slide program for your next bird club meeting. Articles in the Quarterly, *like this issue's discussion of binoculars, can help you become a better-equipped birder. And the information you contribute to our Cooperative Research Program translates into a better understanding of nesting success and bird populations.*

We have also entered the realm of competitive birding. Last spring the Laboratory team made a respectable showing in the world series of birding, sponsored by the New Jersey Audubon Society. This year, you can participate in the event with us by sponsoring the team as it attempts to capture the coveted Ed Stearns Award.

As I write, a green-backed heron is catching minnows from a dead snag outside my office window. Mallards and Canada geese congregate at the edge of the pond to sun and preen. This view—plus the fact that the Laboratory and its programs continue to grow—make me feel especially happy to be part of the world of birding.

CHARLES WALCOTT, *Executive Director*

LANG ELLIOTT

The team, left to right: Rick Bonney, Cricket Smith, Greg Butcher, Charlie Smith, Steve Sibley, Andy Dasinger.

Support the Laboratory of Ornithology Team on Biggest Day '85

On May 18, during the peak of the spring migration, teams of crack birders will descend upon New Jersey in a marathon attempt to see as many bird species as possible in 24 hours. The event is being organized by the New Jersey Audubon Society, which will present two awards: the Urner-Stone Cup for the team with the highest total, and the Ed Stearns Award for the highest total by an out-of-state team. This year the Laboratory of Ornithology plans to capture the Ed Stearns Award.

You can participate. Here's how:

Name the team

Our team needs a name. Several have been suggested, such as The Myopias. How about something more complimentary? Send your suggestion(s) by February 15, 1985. If yours is chosen you'll win a $25 gift certificate to The Crow's Nest Bookshop.

Support the team with a pledge

Pledge 5¢, 10¢, 25¢ or $1 for each species the team finds. Your contributions will not only support the team but also help the Laboratory's more serious programs of research and education. Supporters will receive a report on the event and a list of species found by the team.

Guess the number of species the team will find

We're shooting for 185 but must contend with weather, luck and traffic lights. If your guess is correct you may win our grand prize.

Send your suggested team name on the coupon below or a separate paper and watch your mailbox for more details about the guessing contest and pledging information.

Send to: Rick Bonney, Biggest Day Team Leader, Laboratory of Ornithology, Sapsucker Woods, Ithaca, New York 14850.

Here's my suggestion for a name for the Laboratory of Ornithology's Biggest Day Birding Team:

Team Name

Your Name

Address

City State Zip

The name quetzal is derived from the god Quetzalcoatl, rain diety of the Toltecs.

TOM BLAGDEN JR.

Resplendent Quetzal

Anne LaBastille

DAWN IN THE Guatemalan cloud forest—the first light filters through the dense canopy and down the 150-foot trees. Soon the bird choir begins: the cooing of doves, the chatter of emerald toucanets, the low hoot of a motmot. Perched atop an amate tree a male quetzal proclaims his territory in silvery chords. His head is held high, crest slightly raised, bill open, and ruby-red breast puffed out. Every eight to 10 minutes he gives a series of territorial whistles until shafts of sunlight brighten the gloom. Gradually, the songs of other birds quiet, until only the crackle of falling leaves and scamper of squirrels break the tranquillity.

This scene takes place each March, quetzal breeding season. I first went to Guatemala in the late 1960s to report on this magnificent member of the Trogon family for *National Geographic.* With me was photographer David G. Allen, one of the few to capture the wily species on film. This was the start of my deep involvement with the resplendent quetzal which would span 15 years of field research, conservation efforts, and scientific papers.

I am not the first to be captivated by this regal-looking creature. Centuries ago, both Aztec and Maya Indians of Mexico and Central America revered the emerald-colored, pigeon-sized bird. From the Aztecs we get its name, *quetzalli,* meaning precious or beautiful.

Apparently, these early people caught male quetzals temporarily in order to pluck their two-foot long iridescent green plumes once a year. They never harmed or destroyed the birds. In fact, a commoner who killed one faced death as punishment. The plumes were used as ornaments exclusively for high priests and chieftains and were considered as precious as gold or jade. When Spanish conquistador Hernán Cortés came to Mexico, the Aztec ruler Moctezuma presented his quetzal headdress composed of over 160 plumes as the finest of gifts.

Awe and admiration for the quetzal has continued to modern times. In Guatemala it is a symbol of liberty and the national bird and is seen on the Guatemalan flag, emblem, coat of arms, stamps, artwork, crafts, and textiles. The country's highest civil honor is The Order of the Quetzal. Its currency is the quetzal—one quetzal is equivalent to one dollar.

In the mid-19th century, a naturalist brought the first quetzal specimens to Europe. Ornithologists were amazed by the gorgeous skins. A collecting craze began and for the next 25 years thousands of specimens poured into European museums and markets.

Until David Allen and I spent three months studying these birds, only three other persons in the 20th century had done similar field work. One was Victor von Hagen, a German adventurer-naturalist who, in the early 1900s, was the first man to bring quetzals alive to Europe. Sir Julian Huxley wrote at the time that "This was the most outstanding zoological feat in two decades." Later in the century ornithologist and author Alexander Skutch studied the quetzal, and in 1967 James Kern pho-

BHL

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TOM BLAGDEN JR.

Montane rain and cloud forests, like Monteverde Cloud Forest Preserve in Costa Rica, are indispensable to the quetzal. Right: when the male is sitting in the nest, he faces outward with the plumes bending over his body and projecting out the entrance. When seen next to ferns or bromeliad leaves, these feathers look like vegetation.

tographed the bird on assignment for *Audubon.*

Quetzals are found from southern Mexico to western Panama—1,000 miles along the Central American isthmus. However, they are strictly confined to cloud forest habitat which occurs only high up on the narrow chain of volcanoes and broken mountains which spans the isthmus.

Cloud forests are scarce and inaccessible. They are composed of oaks, laurels, mulberry and wild fig trees, liquidamber, and pines. Trees are laced with lianas and strewn with epiphytes. Such woodland occurs only at altitudes of 5,000 to 10,000 feet in Central America. Mists, fog, clouds, and storms often gather over the slopes. Rainfall averages 100 to 150 inches a year.

On the volcano where I worked, mornings were usually cool and clear. Toward midday, as the sun drew moisture from trees and heated the ground, clouds formed. By afternoon, it poured. One day we were deluged with four inches in four hours.

The courtship and nesting period of quetzals is the only time they are vocal and vibrant. The usually shy and wary birds begin seeking mates and establishing nest sites in January or February. Males often make giddy spiraling flights skyward with their tail feathers rippling behind. These displays resemble the woodcocks' extravagant spring sallies, and are probably courtship acts. The males' feathers and plumes are at their most provocative then.

Once paired, quetzals seek nest sites in decayed tree trunks. They may use natural cavities or abandoned woodpecker holes because their beaks and claws are not strong enough to excavate hard live wood. Some pairs use the same sites year after year; eventually, these rotted stumps crash to earth because of earth tremors, saturation with rain, or old age.

Male and female share the incubation duties and care of young. The normal clutch is two light-blue eggs which are incubated for about 18 days. After the chicks hatch, the adults change their schedule from long periods of inactivity to busy food-gathering and frequent visits to the nest. At first, they give the chicks foods high in protein—grubs, beetles, frogs, lizards, termites, spiders and moths. As the young grow, fruits are mixed into the diet. Adult quetzals are chiefly fruit eaters, snatching or twisting off berries, avocados, and fruits of laurel trees.

By the time quetzal youngsters hop out of their nest cavity, they look like calico cats—a mixture of buff, black, brown and white feathers—and a bit of green. After fledging, both juveniles and adults move higher into the forest canopy. They will partake of 30 or 40 kinds of fruit, and will move up and down mountain slopes to take advantage of various plants in season. Thus, they practice altitudinal migration.

Around 1972 my fascination with quetzals changed to concern over their survival. While in the highlands of Guatemala, I learned of illegal trapping and killing of birds for sale items. A young Indian poacher with a blowgun tried to sell me a quetzal skin for two dollars. Stuffed specimens are sometimes offered to tourists as souvenirs. Laws to protect the national bird were written in 1895 and 1897, yet to this day enforcement and understanding scarcely exist in isolated rural areas.

In Costa Rica, quetzals have been trapped and exported to zoos and private aviaries for years. Between 1956 and 1966, an average of 100 pairs were shipped annually to distant countries. How many birds died en route will never be known. The going price then was $200 a pair. To some extent public awareness and environmental consciousness are growing and the drain on quetzals has slowed, yet just a few years ago, a colleague reported an airline traveler smuggling out a souvenir bag from which glittered the plumes of a stuffed quetzal.

As bad as illegal exportation is, a far worse killer is the reduction of cloud forest habitat all over Central America. Thousands of acres of woodland are being cut and burned in Guatemala and Honduras to be used as farms. Often the fires go wild and burn for weeks during the dry season, gobbling up large tracts of virgin cloud forest. The central plateau of Costa Rica and the mountain slopes of western Panama are coveted by timber companies and foreign ranching concerns. Forests are being cut at a rate of 100,000 to 150,000 acres a year. Such destruction wipes out quetzal habitat and threatens food sources which become more difficult to find as cloud forest tracts are fragmented into isolated stands.

The decline of quetzals was apparent to me in the early 1970s. In response, I organized a project to create a quetzal reserve in Guatemala on the same volcano where we had photographed the birds for *National Geographic.* The

TOM BLAGDEN JR.

DAVID G. ALLEN

If a parent is disturbed outside the nest hole, it will sit upright on a branch and harshly cry "wec-wec-wec." Right, quetzal eggs are vulnerable to predators such as toucanets, squirrels, kinkajous, weasels, and tayras.

owners of this cloud forest were interested in conserving their birds and were willing to donate 1,000 acres for a private sanctuary. Thanks to them, the World Wildlife Fund, USA Appeal, and the Cleveland County Bird Club of Oklahoma, I was able to set up a refuge. Boundaries were marked, signs erected, nest boxes put up, and workmen trained as guards. The Volcano Atitlán Quetzal Cloud Forest Reserve became Guatemala's first private refuge for its national bird.

Two years later, the Panamanian government and the International Union for Conservation of Nature and Natural Resources (IUCN) asked me to survey its first proposed national park, Volcano Barú. Two critical concerns were to find out if quetzals occurred within the park borders and how the birds might act as a tourist attraction. I discovered the birds and prime cloud forest, but realized that sheep ranches and potato farms were encroaching into the park and destroying this habitat.

During the late 1970s, other scientists began to worry that the quetzal might become endangered, even extinct. Besides loss of habitat, certain characteristics make the species prone to annihilation. The birds are fussy in their food habits and choice of habitat. They normally maintain low population numbers and are poor long-distance fliers.

Thus several other sanctuaries were organized for these spectacular birds. In Guatemala, the late Mario Dary, a biologist and rector of the University of San Carlos, created a cloud forest preserve in Baja Verapaz as well as other refuges. In Costa Rica, the private Monteverde Cloud Forest Reserve was established at the crest of the central mountain chain by the Tropical Science Center. Chirripó, the nation's highest mountain, and two other mountains, were designated as national parks by the government in 1975. Honduras established its La Tigra National Park with a handful of quetzals surviving at the summit of this mountain range. El Salvador initiated attempts to develop a refuge near the mountainous borders of Guatemala and Honduras, and Panama formalized Volcano Barú National Park.

In spite of good intentions, tragedies continue to strike. Social and political unrest is destroying much of the conservationists' work, while deforestation and wildfires ruin countryside. In Guatemala, my Volcano Atitlán refuge was infiltrated by guerrillas in the early 1980s. The landowners wrote that birds probably were being shot for food and target practice. Mario Dary was gunned down in the streets of Guatemala City for unknown reasons.

From the Panama Audubon Society came an urgent plea in 1983 for foreign scientists to intervene to save part of Volcano Barú National Park. Potato farmers were cutting a road across parkland through a wild area to shorten their route to market. El Salvador and Honduras are so involved in civil strife and military training that it is doubtful much attention is being given to cloud forest conservation. Only in Costa Rica is protection holding despite economic inflation which has cut into the National Park Service budget and personnel. But most reserves are too small and may not provide the variety of food necessary for quetzals during a whole year. Unless expanded and linked with wild corridors, these sanctuaries will not prevent local extirpations.

Perhaps quetzals and rain forests seem frivolous in the face of inflation, violence, and corporate profits. Not true—the birds and forests are important assets for Central America. The quetzal is a powerful tourist and scientific attraction which brings money into each country through rental cars, guides, gas, meals, hotels. Furthermore, the species is one of very few birds which disperses the seeds of tropical montane forests, the timber of which is a valuable part of the area's economy.

In addition, cloud forests function as part of natural irrigation and water systems. Like giant sponges, they collect rain most of the year, hold moisture, and release it to lower elevations. Cloud forests filter and purify water, and guard against erosion. Humans, domestic stock, wild animals, and crops benefit as long as a mantle of cloud forest is kept intact above them.

Does the quetzal have a chance? So far, only a handful of underbudgeted, undersized, underprotected sanctuaries offer it hope for survival.

FURTHER READING

LaBastille, A. "The Quetzal, Fabulous Bird of Maya Land." *National Geographic,* February, 1969.

Skutch, A. "Resplendent Myth." *Audubon,* September, 1982.

Von Hagen, Victor. *Alla Ricerca del Sacro-Quetzal.* Rizzoli, Milan, Italy. 1984.

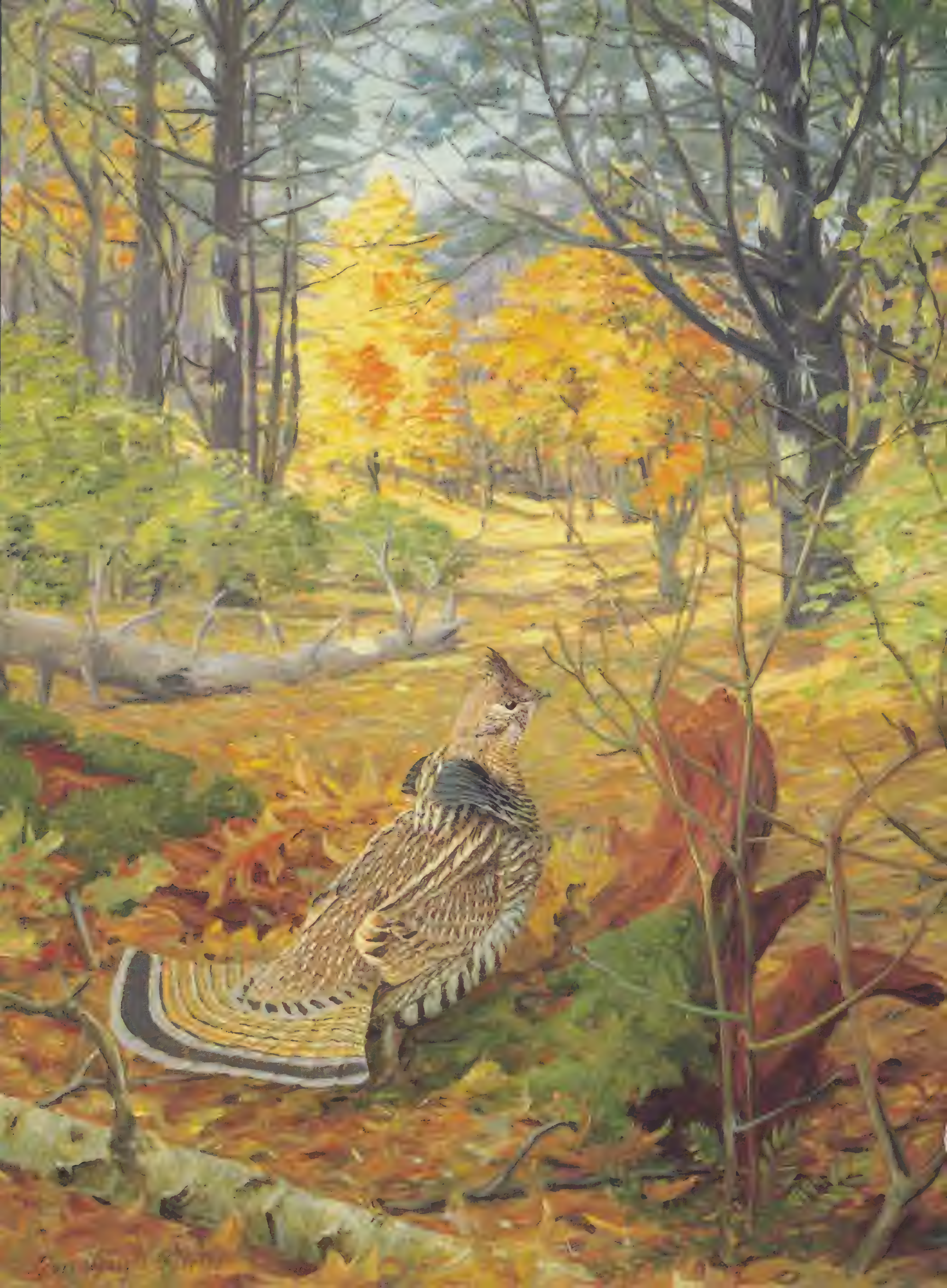
THE AUTHOR

Anne LaBastille is a wildlife ecologist and author of *Woodswoman* and *Women and Wilderness.*

THE LIVING BIRD

Quarterly

Spring 1985



THE LIVING BIRD *Quarterly*

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Front Cover. Outside—Macaroni penguins. Named by sailors because the birds' head plumes reminded them of the coiffure worn by London's 18th-century Macaroni Club, whose foppish members ate strange Italian foods. Photograph by Art Wolfe. Inside—This reproduction of a ruffed grouse by L. A. Fuertes is a gift from the Laboratory for contributions of $250 or more. Write to our Membership Department for details.

Back Cover. Outside—Great hornbill. Photograph by E.P.I. Nancy Adams. Inside—Copper engraving of barn owl. From *Storia Degli Uccelli: Ornithologia*. Petri Leopoldi. Florence, Italy. 1767.

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4 **Some Sticky Solutions**
Sally Hoyt Spofford

After much experimentation, Sally Spofford has reached some controversial conclusions about feeding hummingbirds.

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Laurence L. Alexander

Thousands of common loons died off the Gulf and Atlantic coasts of the United States in 1983. Laurence Alexander was a preserve manager on a barrier island off the Gulf coast of Florida when dead loons began to wash ashore.

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14 **The Enormous Eggs**
Gilbert S. Grant

How fast does an egg six times the size of a chicken egg lose water while it is incubating? To find out, Gilbert Grant traveled to Midway to study the large egg-laying seabirds of that mid-Pacific island.

20 **Where Have All the Songbirds Gone?**
David S. Wilcove

Gone from Rock Creek Park are yellow-throated vireos, black-and-white warblers, hooded warblers, and Acadian flycatchers. And this Washington, D.C. park is just one place where forest-dwelling songbirds are in trouble.

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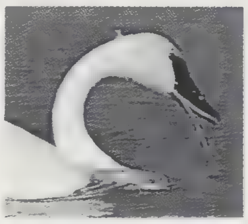
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Thomas C. Grubb, Jr.

You've seen all the birds in your area. If you go to Africa and treble your life list you'll deprive your children of a college education. What could add a new dimension to bird watching? Try the hypothesis game.

BOB AND CLARA CALHOUN (BRUCE COLEMAN INC.) OUR THANKS TO W. R. THURSTON FOR HIS GENEROUS GIFT.

Black-chinned hummingbirds are among several western species that can be attracted with sugar-water feeders or hummingbird-adapted plants.

SOME STICKY SOLUTIONS

Sally Hoyt Spofford

IT'S HARD TO BELIEVE that feeding hummingbirds could be controversial. But when you look into the subject, a surprising number of questions arise. Since we moved to the southwest United States 14 years ago, I have confronted such sticky issues as what kinds of feeders to use, what type and strength solution is best, whether to tint the solution, where to place feeders, whether to leave them out all year, and what to do about bees and cleaning.

There are about 16 species of hummingbirds north of the Mexican border. Of these only one—the Ruby-throated—is commonly found in the eastern states. Western United States is host to the remaining species.

At our feeders in extreme southeastern Arizona on the eastern slope of the Chiricahua Mountains, we have recorded 13 species, eight of which we see each year. Among them are the Lucifer, Black-chinned, Anna's, Broad-tailed, Rufous, Calliope, Magnificent (formerly Rivoli's), and Blue-throated.

After years of observation and experimentation, I have reached some conclusions on the subject of hummingbird feeding, be they right or wrong.

FEEDERS

Several types of feeders are available from mail-order firms, gift shops, and garden supply stores. Many are expensive, and while some have valuable features that are not easy to duplicate at home, it is possible to get along with substitutes such as guinea pig, hamster or poultry watering bottles. My first feeders were small pill vials painted red and taped to sticks which were placed in a flower bed or fastened to a windowsill. I also use open cups—glass jars about three inches wide and two-and-a-half inches deep, such as those pickled fish come in. I have found that wide-mouthed feeders are useful in feeding birds with injured bills or tongues.

Of the commercial feeders, one shaped like a flying saucer with three openings is very popular with our birds, and I usually have five hanging. Other good feeders are glass or plastic bottles which feed by gravity into a container with small feeding holes. Some types can be attached to the windowpane with suction cups, bringing the hummers in for close viewing.

The busiest months are April and September, when we may have 40 to 50 hummers at the feeders at one time. During these migration seasons I have over 20 feeders in operation and may use two gallons of sugar water a day.

SOLUTIONS

When I took up residence in Arizona, I was told that feeding solution should be no more concentrated than one part sugar to four or five parts water. Researchers have found that birds will come to a solution as diluted as one part sugar in ten of water, but no weaker. I imagine that if I diluted mine that much I soon would lose my hummers to neighbors who were more generous.

In a study by F. Gary Stiles (*The Condor,* vol. 78, pp. 10–26), sucrose was preferred to glucose or lactose when a choice was given, although all three sugars occur in most flower nectars. The fact that sucrose is the main ingredient in table sugar from which I make my solutions, helps to explain the rapid attraction of birds to our feeders. And according to William A. Calder III of the University of Arizona, table sugar is closer than honey to the molecular

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JEFF FOOTT

ART WOLFE

Top, Broad-billed hummer remembers where favored feeder was placed last year. Above, Calliope hummer, another western species, may visit feeders when not attending its tiny, lichen-covered nest. Right, nectar-eating bats sip sugar water from a hummingbird feeder.

structure of nectar. Honey may be more nutritious than sugar, but it is more apt to develop a dangerous fungus that affects hummer tongues.

Friends have suggested that additional nutrients be used in the sugar water, especially in cold weather. I have experimented with two additives. A chemist friend asked me to add molasses to the sugar solution. I saw no evidence of preference for this mixture, it spoiled more rapidly, and the feeders were difficult to clean. Another friend, an apiculturist marketing dried pollen, asked me to add some to the sugar solution. His observations at his feeders indicated that the birds preferred solutions with pollen, but I measured little difference. However, it seems reasonable that pollen would be nutritious and as such I encourage its use.

RED

Many of us have had the experience of a hummingbird investigating red clothing or lipstick, and researchers have shown that red seems to be the color hummers prefer. However, hummers will come to sugar feeders of any color. In fact, they can be trained to come to various colors by the reward system. After one sip they learn which color feeders contain sugar water and which contain plain water, and will shift preferences when the colors are reversed. Experiments by Tim Goldsmith of Yale University, some of which were done at our feeders, have shown that the birds' eyes can perceive minute color differences and intensities which may not be perceptible to the human eye.

While red is not necessary, it does seem to bring hummers to a new feeding location sooner than other colors. However, the adding of red coloring to the solution is one of the most controversial subjects in hummingbird feeding. A few years ago there appeared to be some evidence that red food coloring was carcinogenic, at least in experimental animals, and this was interpreted to mean it might harm hummingbirds.

A chemical change was made in the red coloring and I know of no further indication of harm to any organism. Nevertheless, one still reads that it should not be used. I have never stopped using it. True, the hummers do not need it—they come to colorless fluid—but it makes the level of the liquid easy to see and when one has 25 feeders, it saves time in ascertaining which ones need filling and means fewer trips to the feeders and disturbances to the birds. My method is to make a color stock of a quart bottle of water with six to eight drops of red color. About an ounce of this stock is added to a half gallon of sugar solution. In this dilution, a one-ounce bottle of dye lasts a full year.

Whether or not to use coloring should be an individual choice unless scientific evidence proves its use is dangerous.

WINTER FEEDING

Most of my neighbors take in their feeders for the winter. They say they don't want to keep the birds past migration time. This is another controversial subject. My argument is if the presence of an adequate food supply keeps a bird from migrating, then why don't all hummingbirds remain? Day by day the numbers thin out, until late November when the two of us who keep our feeders supplied all year have only a handful of birds: Blue-throats, Magnificents, Anna's, and perhaps a Rufous or two. The Rufous leaves by early December and the Anna's by mid-December, along with some Blue-throats and Magnificents. My guess is that the birds which remain may not be in proper physical condition to migrate, but this is impossible to determine. I do think that those that stay would not survive without our feeders. So it does not seem likely that we are keeping any hummers here by feeding them—and we may be saving the few that cannot migrate south.

In December 1978 southeastern Arizona experienced an extreme cold spell when the temperature did not rise above freezing for 92 hours, dipping almost to zero degrees Fahrenheit one night. We kept alive four or five of the six hummers still here by providing warmed sugar water from dawn until dusk. The birds were members of the two larger species, Blue-throated and Magnificent. They remained the rest of the winter.

SAME SPOT

Those who have fed hummingbirds for some years have noted that returning individuals will go to the exact spot where their favorite feeder was placed the year before and hover there if the feeder has been moved or not yet hung for the season. Even migrants, which had stopped only a short time the preceding season, "remember" former feeder positions. Among the earliest banders of hummingbirds were the James Selbys in Ontario. They verified this behavior by their banded birds returning, some up to four or five years. It seems advisable, therefore, to place feeders in the same spot each year.

PERCHES

We have a large live-oak tree in our yard and at the peak of the hummer season we may spot several dozen perched in it. The first time a male Lucifer (very rare north of the Mexican border) came to our feeders, he found such a perch and remained on it for an hour. In very cold or stormy weather, the hummers seem to seek perches close to the ground; in our case this means in mesquite bushes or pyracantha. We have seen a dozen Black-chinned Hummingbirds perched low in an early April snowstorm.

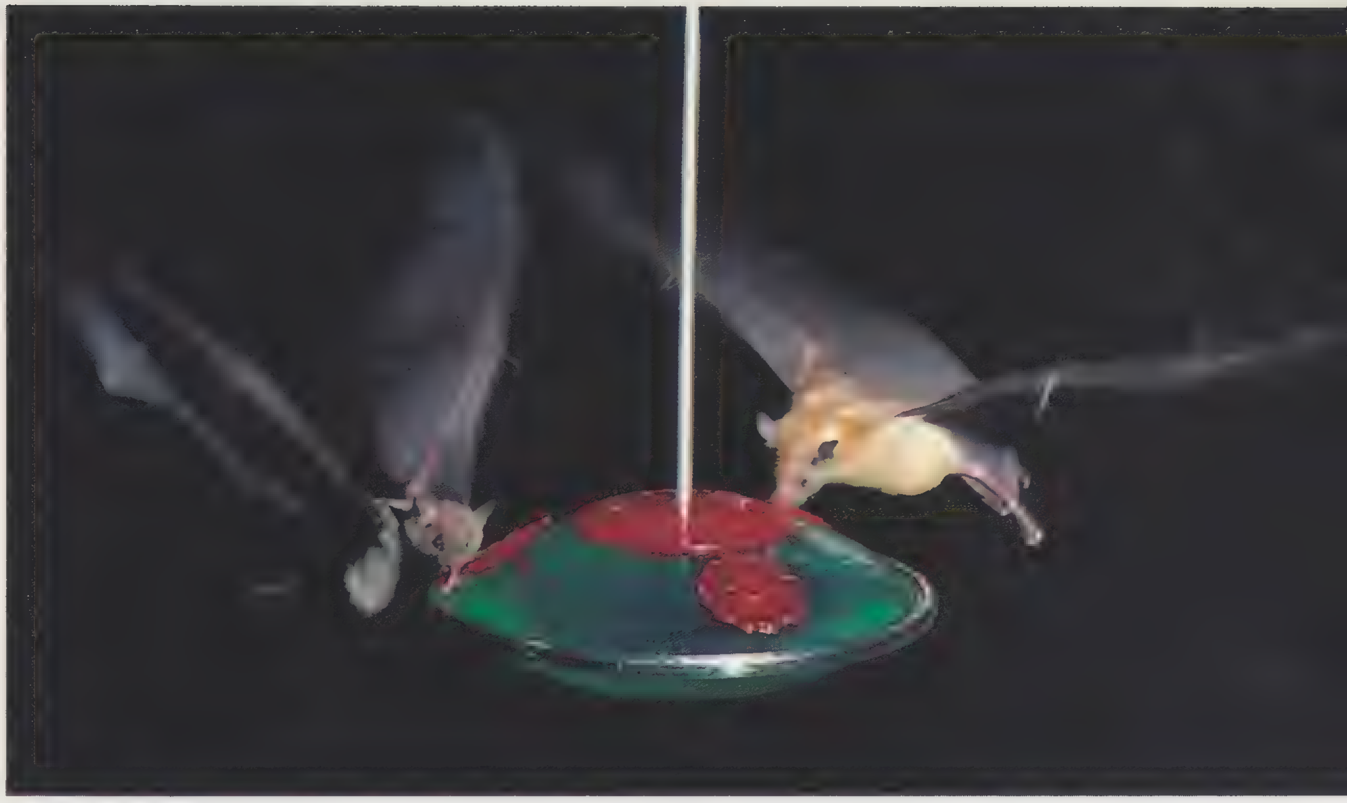
Perches are not necessary on or beside feeders, but when available the Blue-throated and Magnificent use them. The two larger species need the perches farther away from the drinking tube than do the smaller hummers. Perches also make for better viewing or photography since the birds sit still briefly instead of darting back and forth to the feeding tube.

SHELTER

Some sort of shelter, a tree or shrub near the feeder, is also recommended. Hummingbirds do not have many enemies; they are the only birds not alarmed when a Cooper's Hawk shows up in our yard. However, they can be caught by the larger flycatchers and by Greater Roadrunners. It would seem that they would be safe from the latter, except when feeding from low flowers or feeders, but I have photographed a Greater Roadrunner catching a Black-chinned Hummingbird in flight by leaping from our roof into the air near a feeder hung from the eaves.

ODDITIES AND OTHERS

Many species other than hummingbirds use our feeders, and my 20 or more feeders operating at the height of the season are of a variety of types to suit all needs and tongues. House Finches, three species of orioles, and two of tanagers like the open cups, which must not be too narrow or too deep or birds may fall in. A few years ago an albino hummingbird spent some time at a feeder near us. Few albino hummers have been noted in the wild. Hybrids can be spotted, such as one visiting feeders in our area in 1973.



ERNEST FRANZGROTE

At night our feeders are visited by mammals, including raccoons, foxes, coati-mundis and ringtails, so a few feeders are placed where they can be reached by four-footed visitors. In late summer and early fall, our feeders are used by two species of Mexican nectar-eating bats. That is one reason why some of our neighbors take in their feeders at night. We are fascinated by the bats and have photographed them, although the sugar consumption goes up considerably at this time. But our philosophy is that we feed whatever wildlife comes to us, even if it becomes a nuisance and added expense. However, we do not attempt to tame wildlife, or make it too dependent on our offerings.

BEES

Bees can be a serious problem when they monopolize all the feeders. There are wild "bee trees" in our area, and hives belonging to local apiculturists. I have found that commercial bee guards do not work very well. Even if the bees don't reach the sugar water through the guards, bees will cluster on them and keep the hummers away. I have trapped bees with a jar into which a plastic funnel is inserted just above the level of the sugar water. The bees enter the jar through the funnel, but can't seem to get out. However, since we do not want to interfere with our neighbors' livelihood, we attempt to discourage, not kill, the bees. Although it has not worked well for us, John Dennis in *A Complete Guide to Bird Feeding,* recommends brushing salad oil onto exposed parts of feeders to reduce insect competition.

CLEANING

It is essential for feeders to be cleaned at least once a week. Sugar water will spoil, especially in warm weather, and molds which can harm or kill hummers form even in cold weather. Use only hot water, not soap or detergent. Test-tube or small bottle brushes will help in scrubbing the inside, or one can place small pebbles or raw rice in the water, and shake vigorously. For very small tubes, I use a pipe cleaner.

Alexander Skutch, who has done intensive studies of hummingbirds in Central America and whose book on them is a classic, has pointed out that the cutting of tropical forests has enormously affected birdlife and may lead to the extinction of some species. However, he thinks that hummingbirds may adapt better than other birds to cut-over areas and flower gardens in suburban settings. While the United States has fewer resident hummingbirds, these probably are helped by the feeders we supply as well as by our planting of suitable flowers and shrubs.

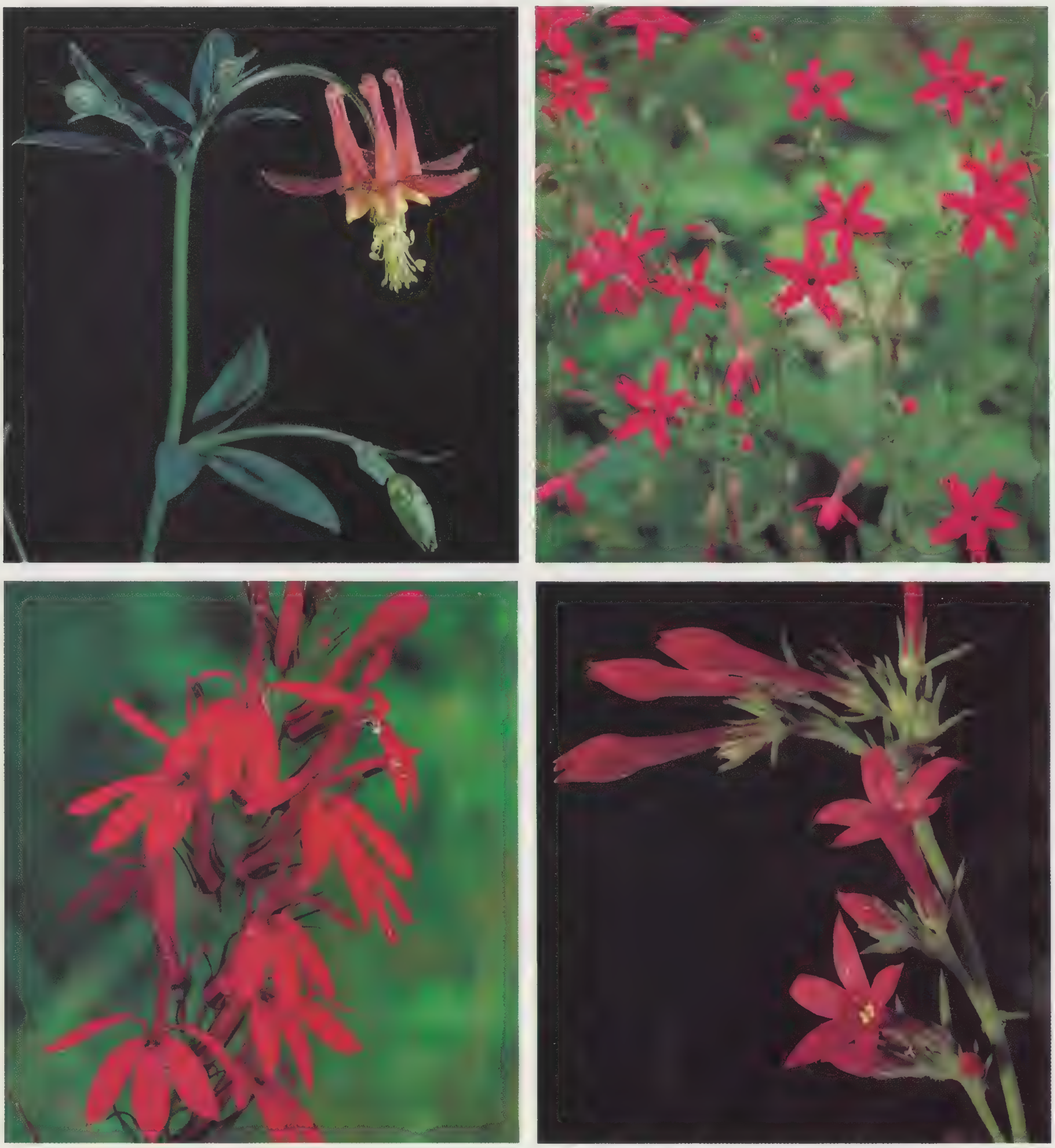
FURTHER READING

Johnsgard, Paul A. *The Hummingbirds of North America.* Smithsonian Institution, Washington, D.C. 1983.

Skutch, Alexander I. *The Life of the Hummingbird.* Crown Publishers, New York. 1983.

THE AUTHOR

Sally Hoyt Spofford received her Ph.D. from Cornell in 1948 and retired from the staff of the Laboratory of Ornithology in 1969.



FLOWERS FOR HUMMERS

ANOTHER GOOD WAY to lure hummingbirds to your garden is with hummingbird-attracting flowers—large, red or reddish-yellow blossoms that grow singly or in loose clusters in a horizontal or pendant position. Usually trumpet shaped, they bloom by day and produce abundant, concentrated nectar, the most important food in the birds' diet. Such flowers have evolved to attract hummers because they serve as pollinators: while a hummer feeds at a flower it picks up pollen on its feathers, which it then transfers to the next flower it visits. The more attractive a flower, the more likely it is to have its pollen spread..

What flowers should you plant? In the northeast and midwest try cardinal flower, bee balm (Oswego tea), columbine, buttonbush, autumn olive, honeysuckles, trumpet creeper, tuliptree and silk tree. In the southeast try painted cup, fire pink, cardinal flower, red and flame buckeyes, Turk's head (wax mallow), trumpet creeper, trumpet honeysuckle, red horsechestnut, and tuliptree. In the southwest try paintbrushes, penstemons, scarlet gilia, ocotilla, honeysuckles, chuparosa, coral bean, and eucalyptus. In the northwest try columbine, penstemons, red currant, manzanita, rhododendrons, orange honeysuckle, and madrone. A more comprehensive list of hummingbird-attracting flowers may be found in Johnsgard's *Hummingbirds of North America.*

When planting for hummingbirds keep these points in mind: choose tall plants that birds can reach by hovering, rather than plants that grow close to the ground; plant a variety of flowers that will bloom at different times throughout the growing season; leave an open area around plants so the birds can watch for danger, and provide nearby perching sites, such as shrubs or clotheslines. Also, perennial flowers require less work than annuals, but if you use annuals, plant them in the same place each year since hummers remember the location of good feeding spots and return to them.

Facing page—bee balm (Oswego tea). Above, clockwise from top left—columbine, fire pink, scarlet gilia, cardinal flower.

TROUBLE WITH LOONS

Laurence L. Alexander

Many thousands of common loons died on their wintering grounds off the Gulf and Atlantic coasts of the United States during 1983. Laurence Alexander was preserve manager for The Nature Conservancy's Jeff Lewis Wilderness Preserve on Dog Island, a barrier island on the northern Gulf coast of Florida, when dead loons began to wash ashore.

Common loons breed on beautiful wilderness lakes of northern United States and Canada.

MY HOME, DOG ISLAND, is one of three barrier islands which shelter Apalachicola Bay and St. George Sound on the northern Gulf coast of Florida. The waters of this large natural area provide winter habitat for several kinds of migratory water birds, one being the common loon, a species belonging to the oldest living group of birds in North America.

Common loons breed primarily in the northern United States and Canada, where their haunting yodels echo across wilderness lakes each summer. During winter they migrate to the Atlantic, Pacific, and Gulf coasts. The common loon also is known as the great northern diver because it can swim underwater for as long as 15 minutes while pursuing fish, its primary prey.

Recently, ornithologists have worried that human development along wilderness lakeshores where loons breed is causing the species to decline in number. Further concern resulted when people began finding dead loons along the coasts in winter. However, problems on the wintering grounds were poorly documented—until 1983.

On January 4, 1983 I found my first dead loon of the season; the last victim was picked up near St. George Island that August. During the intervening months, hundreds of weak, hungry loons found shelter on Dog Island, often crawling thousands of yards in search of calm waters. I gathered many of these birds and released them in protected intertidal marshes. Yet, all soon died, so weak and emaciated that they could not swim or lift their heads. Strangely, no other species of marine or aquatic bird was experiencing unusual mortality, not even other fish-eating birds such as grebes and cormorants.

By February I was finding 10 to 20 loons a day on Dog Island beaches, far more than previous years. On February 2, I called Frances James, an ornithologist at Florida State University, and asked her to visit the island as soon as possible. On February 20 she and several students arrived. We found 16 dead loons within one mile of their lodgings.

Cursory examinations of these birds revealed empty stomachs and intestines and atrophy of the flight muscles. All birds had molted their flight feathers (normal for loons in winter) and were thus flightless. We agreed that the symptoms suggested a serious nutritional problem and that the extent of the mortality was developing into a crisis.

At that point I contacted the National Wildlife Health Laboratory (NWHL) in Madison, Wisconsin. Robert E. Lange, Jr., a field diagnostician, said he was unaware of the die-off and was seriously concerned. We arranged for him to visit the island immediately. Meanwhile I shipped a few fresh carcasses to the NWHL facility for tests.

On March 18, Lange arrived with Randy Davidson of the University of Georgia and Neal Eichholz of the Florida Game and Fresh Water Fish Commission. Lange and Davidson examined dead and dying loons and found that all exhibited bleeding in the intestines, anemia, empty guts and stomachs, and extreme emaciation—they weighed less

GLENN FORREST

Dead loons such as those on the far left showed intestinal bleeding, anemia, empty stomachs and extreme emaciation. If death was caused by mercury contamination, even healthy-looking loons (left) may be in peril.

> Of the seven birds examined, four had mercury intoxication levels at or above the threshold thought to cause death

than half their normal body weight.

On March 29, Davidson released an interim report which confirmed the presence of the symptoms in all loons examined and estimated total mortality through March for the northern Gulf coast at 2,500 loons. But as reports accumulated it became clear that the die-offs ranged along both the Gulf and Atlantic coasts, and that total mortality was much higher.

My own survey of the shoreline and marshes of St. George Sound conducted through the summer suggested that as many as 7,500 loons died in the immediate area. At least as alarming was a report issued by Malcolm Simons' Beached Bird Survey, a volunteer-based shoreline census. Besides substantiating the extent of mortality, the report stated that for a number of years far more dead loons had been found on eastern beaches than would be expected based on known population sizes.

By April clinical findings were beginning to give us some idea what was happening to the loons. In addition to confirming the conditions we had noted on Dog Island, the tests indicated an abnormally high presence of an intestinal parasite known as the microphallid fluke. Initially, researchers thought the parasites might be causing anemia which in turn weakened the birds to the point where they could no longer feed. However, toxicological studies performed at Patuxent Wildlife Research Center provided a more direct and dramatic clue: of the seven birds examined, four had mercury intoxication levels at or above the threshold thought to cause death; one bird had at least three times that level.

A comprehensive summary issued by NWHL in December 1983 emphasized the role of mercury toxicity in the die-off. Further tests revealed that 19 of 22 additional sample birds exhibited mercury levels high enough or nearly high enough to cause death.

It is clear that the accumulation of mercury in loons has reached levels that probably are affecting the entire population. Loon counts around Dog Island in the winters of 1984 and 1985 were significantly depressed from previous years, and each year I continue to find emaciated, dead or dying loons. The rest of the grim facts will unfold in summers to come when we discover how mercury toxicity has affected reproductive success.

There are many unknowns in the life history of the loon, particularly in its winter distribution and ecology. For example, we don't know how loons forage for food; are they opportunists or do they depend on specific foods? Do they maintain feeding territories as they do in the breeding range? Answers to these and other questions, such as where the mercury is coming from, and why only loons are being affected, can come only from patient, detailed research. Toward this end I believe specific steps must be taken.

First, the Office of Endangered Species of the U.S. Fish and Wildlife Service should determine the species' status. In view of the events of 1983, the persistence of beached loons in excess of their relative abundance, an earlier unexplained die-off in 1973, and the destruction of their wilderness breeding habitat in northern United States and Canada, the species may qualify as threatened under the Endangered Species Act. If the common loon acquired this status, a centrally coordinated research program could be initiated which would improve the quality and availability of data to researchers and would guarantee funds.

Second, a broad base of public awareness of the problems facing loons must be created in the United States and Canada so that private and public support of research can increase. If, as has been suggested, acid rain is responsible for the presence of mercury in loon food webs, this surely is an issue that should unite Canadian and American citizens in a call for action. Only with awareness, support, and swift, unified action can we stop the precipitous decline of this extraordinary species.

FURTHER READING

Barlow, William. *Voices of the Loon,* a record album. North American Loon Fund, Meredith, New Hampshire and the National Audubon Society, New York. 1980.

Graham, Frank Jr. "Mystery on Dog Island." *Audubon.* March, 1984.

Stroud, R. K. and R. E. Lange, Jr. *Information Summary: Common Loon Die-Off, Winter and Spring of 1983.* U.S. Fish and Wildlife Service National Wildlife Health Laboratory. 1983.

THE AUTHOR

Laurence Alexander is working on a Ph.D. in zoology at the University of Florida.

Laysan albatrosses lay huge eggs, six times the size of a chicken egg, which they incubate for 65 days before the young finally hatch (right).

The Enormous Eggs

Gilbert S. Grant

Photographs by Frans Lanting

FOR YEARS I DREAMED of traveling to a remote tropical island to study seabirds so tame they could be observed at close range, even touched. My dream came true when I was invited to join a team of scientists from the University of Hawaii and the State University of New York at Buffalo to travel to Midway Island. We went to Midway to study the nesting biology of the black-footed albatross, Laysan albatross, Bonin petrel, and white tern. All four species incubate their eggs for unusually long periods; we wanted to learn how this prolonged period affected the rate of water loss from the eggs.

Midway is in the Pacific Ocean, 1,100 miles northwest of Honolulu, near the end of the volcanic island chain which composes Hawaii. Midway's mountain long ago subsided beneath the sea and all that remain are two tiny islands, Sand and Eastern Islands, with a combined area of two square miles. A coral atoll five miles in diameter surrounds the islands. The white coral sand beaches, green water, colorful tropical reef fish, and 500,000 birds make Midway a paradise for ornithologists.

Our October 1979 arrival coincided with that of the Laysan and black-footed albatrosses. They had been at sea during the previous three months—some had gone to Japan, others to the Aleutians, still others to the coast of California—in search of squid. I fell in love with the island the minute I stepped off the plane and saw scores of these majestic birds soaring over the ironwood trees at the edge of the runway. The Navy, which has a small base on Midway, provided us with a lab in an old schoolhouse and bicycles to get around the island.

No native human population ever became established on Midway, presumably because of the lack of fresh water. However the military, which once was very active on Midway, altered the pristine islands by covering them with runways, buildings, and communication towers. In the late 1970s Eastern Island was given back to the birds—the Navy bulldozed most of the buildings and all of the towers. Terns and albatrosses again are nesting on the runways. Sand Island, even with its extensive construction, supports half of Midway's albatrosses and all of its nesting Bonin petrels and white terns. Open fields, yards, and ironwood forests provide nesting sites for these seabirds. White terns nest high in the ironwoods and on buildings, albatrosses nest on the ground, and Bonin petrels excavate burrows.

Laysan and black-footed albatrosses are closely related tube-nosed seabirds, each having a six- to seven-foot wingspan. The Laysans nest side by side in the center of the islands while the less numerous black-footed albatrosses tend to nest around the periphery. Both arrive in October with the bulk of the black-footeds preceding the Laysans by two weeks. The birds establish new bonds and reaffirm old ones using a ritualized dance consisting of several steps, and vocalizations reminiscent of horses, cows, and chickens that are re-

MARTIN KUHNIGK (VALAN PHOTOS)

peated for hours on end, day and night.

Egg laying by both species of albatross occurs in November and early December and the large egg (equivalent to six chicken eggs) must be incubated for 65 days (chicken eggs need about 21 days). A few days after the egg is laid the female departs for the sea to replenish her energy supply. The male takes over for the next three weeks, never leaving the nest.

We know very little about the courtship rites of the Bonin petrel because it is nocturnal. Its enormous egg weighs 22 percent of the female's total weight and requires 49 days to hatch. The tern egg also experiences prolonged incubation: 36 days are required to produce a down-covered chick with giant feet. White terns have no nest; they lay their eggs directly on a branch.

All bird eggs come equipped with food and water for the developing embryo since these nutrients cannot be supplied once the egg is laid. Eggs have thousands of tiny pores to allow oxygen to enter and carbon dioxide to escape. These pathways also are traveled by water molecules escaping to the drier environment of the nest and atmosphere.

Because incubation of these four species is prolonged, we were interested to learn how their eggs are modified to ensure appropriate rates of water exchange. Amos Ar and Hermann Rahn have shown that most bird eggs, regardless of size and incubation periods, lose about 15 percent of their initial weight as water vapor during incubation. Do albatross, petrel and white tern eggs lose only 15 percent of their initial weight even though their incubation periods are nearly twice that of other birds?

To document the rate of water loss, we marked hundreds of nests and checked them daily so we knew when egg laying occurred. Freshly laid eggs were numbered, weighed, and returned to the nest. The eggs were weighed periodically throughout incubation.

We discovered that eggs of all four species lost about 15 percent of their weight during the entire incubation period. How could this be? After various experiments, we found that egg temperature, humidity, and porosity acted together to keep the rate of water loss to 15 percent.

The next question was whether the reduced porosity in turn reduced oxygen consumption and growth rates within an egg. To investigate this, we removed albatross eggs from their nests and brought them into the laboratory. From earlier studies we knew albatrosses would incubate any object placed in their nests, including beer cans, bricks, and tennis balls. To keep the parents from missing their eggs, we replaced the real ones with pantyhose containers filled with dirt. We incubated the eggs in the lab in a modified human baby incubator and measured the amount of oxygen the embryos consumed. The metabolism of embryos was indeed reduced corresponding to the reduced porosity. This meant that the embryo took longer and used more energy to develop into a chick.

Why do seabirds have prolonged incubation? The reason may relate to the birds' food needs: the location and amount of fish and squid change from year to year causing seabirds' food supplies to be especially unpredictable. Because of this uncertainty, the birds may have evolved lowered metabolism and slow growth rates as well as delayed breeding and prolonged incubation.

THE ENORMOUS SQUIDS

Many tons of squid are harvested each year by commercial Japanese fisheries from the same area of the Pacific Ocean where the albatrosses of Midway feed. How much food do the birds need to carry out their daily activities, including the task of laying and hatching an egg equivalent to six chicken eggs? Are the birds in competition with the fisheries for the ocean's resources? To answer these questions, we had to find out what and how much the birds ate.

Left, the amount of squid changes yearly, contributing to prolonged incubation. Above, Laysans establish mating bonds with ritualized dances.

Left, a collection of plastics brought to albatross colony by adults feeding their young. Above, black-footed albatrosses.

We also needed to measure their metabolic rates so we could calculate how many pounds of food were required to support the seabirds. But how?

We knew that albatrosses are strongly attached to their nest sites. We learned this when we helped the Midway public works department to move a dozen Laysan albatross nests to make room for a freshwater pumping station. The nests had to be displaced about 20 feet; simply building a new nest and transferring the egg or chick to the new site failed. Albatrosses remained on their old but empty nests in plain view of their exposed egg or chick.

When we tried lifting the nest, egg or chick, and incubating parent as a unit and depositing them in a safer site, the albatrosses got off their egg or chick, ambled back and sat down in the hole that had been their former nest.

So, instead of taking the birds to the metabolic chambers, we decided to take the chambers to the birds. To do this I first slid plywood platforms beneath the five nests closest to the lab. When I was ready to take some measurements on an incubating albatross, I gently lifted the platform and slid the entire assemblage into the chamber. Next I eased the chamber over the exact nest site.

To measure the metabolism of non-incubating albatrosses I simply herded them into the chamber. They settled down quickly and did not appear stressed. We showed that it did not cost adult albatrosses any extra energy to incubate their eggs.

In addition to albatrosses we wanted to measure the metabolic rate of white terns and Bonin petrels. The precarious tree-branch nest of the white tern did not lend itself to measurement, however we were able to test the Bonin petrel. As in the case of the albatross, we found that the petrel did not expend extra energy to incubate its relatively large egg.

Besides measuring metabolic rate, we wanted to answer the larger question of how much total energy flows through Midway's bird population. This required weighing chicks periodically and monitoring what parents fed to them.

The food items we encountered most frequently were squid and fish. The size of some of the prey was startling. One discarded squid arm was 5 feet 10 inches long. Even more shocking was the quantity of plastics fed to albatross chicks by their parents. A sampling disclosed plastic bottle caps, perfume bottles and toys of every description—soldiers, Indians, cowboys, alien monsters, monkeys, rabbits, dinosaurs, elephants, camels, cats, and dogs. Where did these items come from and why were they picked up by the adults?

Almost every bottle cap that was labeled had been made in Japan. Since most albatrosses feed near Japan, this debris must have been floating on the birds' foraging area. We suspect the birds were attracted to the plastics' bright colors, or to fish eggs attached to the flotsam and jetsam.

With the information we had gathered about egg incubation and energy consumption, we calculated that it takes millions of pounds of fish and squid per year to support the seabirds on Midway. We concluded that the seabirds were indeed competing with human fishermen for the ocean's resources.

Management of the harvest is necessary to ensure that sufficient food will be available to both humans and seabirds. Continued monitoring of seabird populations can provide early indications of trouble in marine ecosystems that could harm both the Japanese fish industry and the half-million birds packed into the two square miles of Midway.

FURTHER READING

Fisher, M. L. *The Albatross of Midway Island: A Natural History of the Laysan Albatross.* S. Illinois University Press, Carbondale, Illinois. 1970.

Haley, Delphine, ed. *Seabirds of Eastern North Pacific and Arctic Waters.* Pacific Search Press, Seattle, Washington. 1984.

THE AUTHOR

Gilbert Grant teaches biology at Coastal Carolina Community College in Jacksonville, North Carolina, and is continuing his field research on birds.

WHERE HAVE ALL THE SONGBIRDS GONE?

David S. Wilcove

ROCK CREEK PARK—an island of forest in the midst of Washington, D.C. At one time this park of mature deciduous oaks, beeches, hickories and tuliptrees harbored a rich community of breeding birds. A 1948 bird census recorded ovenbirds, red-eyed and yellow-throated vireos, black-and-white warblers, hooded warblers, and Acadian flycatchers. Today, although the forest has not changed much, the birdlife has. Gone are the yellow-throated vireos, black-and-white warblers, hooded warblers, and Acadian flycatchers. Ovenbirds have declined by 94 percent, and red-eyed vireos by 79 percent. And Rock Creek Park is just one place where forest-dwelling songbirds are in serious trouble.

Over the past decade scientists have realized that what is happening in Rock Creek Park is occurring throughout the eastern and central United States. Studies in Massachusetts, Connecticut, New York, New Jersey, Delaware, Maryland, Illinois, and Wisconsin show that certain forest songbirds are absent or declining in urban parks and small fragments of once-larger woodlots. Curiously, the declines do not involve all forest-dwelling songbirds. Rather, one group—the neotropical migrants—is affected most dramatically. These birds, which include vireos, warblers, and flycatchers, breed in North America, then migrate to Latin America or the Caribbean where they spend the winter.

If conservationists are to prevent further declines of these birds, two questions must be addressed. First, why are small woodlots losing breeding populations of songbirds, and second, why are the songbirds that migrate to the neotropics prone to local extirpation? Answers are just beginning to surface.

In the summer of 1983 I set out to determine if part of the problem was nest predation—the loss of eggs or nestlings to predators. Rats, dogs, and pigs have had a disastrous impact on the birds that dwell on oceanic islands. For example, on Lord Howe Island, Australia, rat predation has caused five bird species to become extinct since 1918, when rats first arrived on a wrecked ship. Could a similar thing be happening to songbirds in our suburban woodlots, which are islands of forest in a sea of man-made habitat? Are more nest predators present in these fragments than in larger tracts?

To test this hypothesis, I placed artificial nests containing Japanese quail eggs in forests of different sizes in Maryland and Tennessee. I put some nests on the ground and some in shrubs and saplings since I wanted to learn if the placement of a nest influences its chances of being preyed upon. After one week I checked for evidence of predation.

My study sites included the Great Smoky Mountains National Park in eastern Tennessee and 10 woodlots in central Maryland. Great Smoky Mountains Park is the largest contiguous forest in the eastern United States, encompassing about 517,000 acres. It resembles the pre-Colonial forest that once stretched from the Atlantic Ocean to the Mississippi River. The Maryland sites included two large forest tracts and eight smaller fragments. The Smoky Mountains and large Maryland tracts still retain all their breeding neotropical migrants; the eight fragments are missing many of the same species that have vanished from Rock Creek Park.

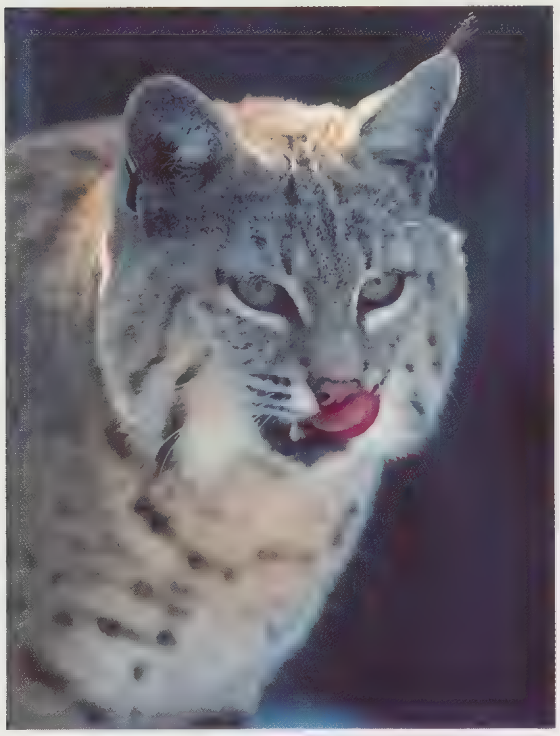
The results of my experiments were astonishing. Nests placed in the Great Smoky Mountains National Park suffered a very low predation rate of 2 percent. The next lowest rate, 18 percent, came from the largest Maryland tract. Predation rates in the fragments ranged from 25 percent to 95 percent, the highest rate being in areas surrounded by suburban housing developments. I concluded from these findings that predation rates are indeed higher in small fragments, especially in suburban areas, and that not even the largest Maryland tract approached the very low predation rate I found in the Smoky Mountains.

Several factors may account for the higher rates of nest predation in the small forest fragments. First, numbers of some nest predators have increased in recent years as a result of artificial changes in the landscape. Blue jays may be benefiting from the popularity of winter feeding stations, and crows have increased in response to grain and corn left in fields by mechanical harvesters. Second, forest fragments support few, if any, large animals like mountain lions, bobcats, large hawks and owls that may regulate populations of some nest predators. Third, nest predators such as jays, crows, grackles and raccoons are more common along forest edges than in the

Red-eyed vireos (left) are declining seriously in fragments of once-larger woodlots throughout the eastern and central United States.

ROBERT C. SIMPSON (VALAN PHOTOS)

R. HAMILTON SMITH (FROZEN IMAGES)



E.P.I. NANCY ADAMS

Nest predation and cowbird parasitism may be causing songbird declines. Cavity nests, top, are safer than open-cup nests. Parasitic cowbird chick crowds young warbler from its open-cup nest, right. Fragments support few large animals such as bobcats, above, that help to regulate nest-predator numbers.

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interior. Since fragments have a higher edge-to-interior ratio than larger tracts, fragments also may have greater densities of predators. In addition, woodlots near human dwellings may have more dogs, cats, jays, grackles, squirrels, and raccoons than do isolated rural woodlots.

My test results clearly point to nest predation as a factor in songbird population declines. But why should certain neotropical migrants be more vulnerable than other birds? As first noted by Robert Whitcomb, Chandler Robbins, James Lynch, and other researchers, many of these birds are sensitive to nest predation because of their breeding habits. Many neotropical migrants, such as ovenbirds, black-and-white warblers, worm-eating warblers, and hooded warblers, nest on or near the ground; many forest-dwelling nonmigrants nest at least six feet above the ground. Indeed, my experiments bore out the fact that ground-dwellers are more vulnerable than above-ground nesters. I found at two of my sites that experimental nests on the ground were preyed upon significantly more than those placed in the shrubs.

Another point of vulnerability is the nests themselves. Most neotropical migrants construct open, cuplike nests, while many nonmigratory birds—woodpeckers and titmice, for example—nest in tree cavities. Cavity nests are thought to be less vulnerable to predators than the open-cup design. To test this idea I returned to one of my experimental suburban fragments and built artificial cavity nests by drilling small holes in hollow tree trunks and depositing fresh eggs. I also set out some open-cup nests with eggs. After a week virtually all of the open-cup nests, but none of the cavity nests, had been preyed upon.

Still another problem for neotropical migrants is their tendency to have smaller clutches and fewer broods per year than nonmigrants. Thus, a single act of predation late in the breeding season can wipe out a bird's reproductive effort for an entire year, a bleak prospect for a small, short-lived songbird that undertakes a hazardous migration twice each year.

Predators are not the only problem confronting songbirds in forest fragments. The birds also must contend with brown-headed cowbirds, brood parasites which lay their eggs in the nests of other birds at the expense of the host's own eggs and offspring. Margaret Brittingham and Stanley Temple of the University of Wisconsin have documented the phenomenal increase in cowbirds in the United States over the past 50 years. Agricultural practices that provide cowbirds with waste grain and rice during the winter have boosted their numbers. Brittingham and Temple have shown that parasitism by cowbirds is most intense along the forest edge, decreasing farther into the forest. Since an increased proportion of edge to interior is an inevitable by-product of fragmentation, birds in small woodlots may suffer higher rates of cowbird parasitism than those in large tracts. And open-cup nests make easy targets.

The problems of migrant songbirds are not confined to North America. They are also having trouble on their wintering grounds in Latin America, where tropical forests are being cleared at an ever-increasing rate for canefields and cattle pastures. Consequently, the wintering habitats of at least 55 migrant species are threatened. Censuses from a large forest tract in West Virginia have shown that breeding populations of some of these species, such as the Blackburnian and magnolia warbler, have declined. It is likely that if tropical deforestation continues unchecked, the future for these and other neotropical migrants is grim.

If we are to preserve forest-dwelling migratory songbirds we must attend to their needs on both their breeding and wintering grounds. In North America our first priority must be to preserve critical large forest tracts before they are destroyed. Bird watchers can assist by identifying populations of area-sensitive woodland birds and pressing for their protection. We know surprisingly little about the behavior and distribution of migrants on their wintering grounds and more research there is needed. Finally, any assistance we in the United States and Canada can provide for habitat protection in Latin America and the Caribbean will benefit not only tropical ecosystems, but some migratory songbirds as well.

And if we fail to act? The loss of so many insect-eating birds may have long-term ecological consequences for our forests. As for aesthetics, a park like Rock Creek is still a fine place to spend a summer morning. But for those who consider the songbirds an important part of its appeal, Rock Creek Park will never be the same.

FURTHER READING

Brittingham, M. C. and S. A. Temple. "Have cowbirds caused forest songbirds to decline?" *BioScience*, vol. 33, pp. 31–35.

Wilcove, D. S. and R. F. Whitcomb. "Gone with the Trees." *Natural History.* September, 1983.

Wilcove, D. S. "Nest predation in forest tracts and the decline of migratory songbirds." *Ecology*, in press.

THE AUTHOR

David Wilcove is a Ph.D. candidate in biology at Princeton University.

NEWS & NOTES

Compiled by Steven C. Sibley

KENNETH W. FINK (BRUCE COLEMAN INC.)

Atlantic puffin

NATIONAL AUDUBON Society's puffin reintroduction project, under the direction of Laboratory of Ornithology Associate Stephen W. Kress, transplanted 200 puffin chicks to two Maine islands from Great Island, Newfoundland in 1984. This was the first attempt to reestablish puffin colonies on Western Egg Rock and Seal Island, where puffins have not bred since 1887.

On Maine's Eastern Egg Rock 14 pairs of Atlantic puffins bred last summer, equaling the largest number of breeding pairs there since reestablishment of the colony in 1981. Eleven of the 14 pairs fledged young. Last summer also marked the first return to Eastern Egg Rock of a native puffin fledged on the island by wild adults.

THE LABORATORY of Ornithology's Nest Record Program is being used to study eastern bluebirds. Robert Cerwonka, biology department chairman at the State University of New York at Potsdam, is examining 25,000 nest record cards, each corresponding to a nesting attempt by a pair of bluebirds. This information will reveal trends in bluebird clutch size, nesting success, and time of breeding. Some researchers believe that eastern bluebird populations have been declining in the northeastern United States.

The Nest Record Program is the largest database on nesting behavior of North American birds. The Laboratory hopes to conduct many more projects using the records to monitor North American bird populations.

The Nest Record Program is more meaningful the more cards it has on each species. Anyone can participate. If you'd like to help, please write to: Nest Record Program, Laboratory of Ornithology, Cornell University, Sapsucker Woods, Ithaca, New York 14850.

NORTH CENTRAL PLASTICS, Inc., the nation's largest manufacturer of electrical fencing supplies, has announced it will no longer produce red insulators. Hummingbirds attracted to the color were electrocuted when they simultaneously touched the wire and metal post. Now the company manufactures only black insulators, which do not attract the birds and may be used to replace red ones already in place. Red insulators also may be painted black.

THE EDITORS of *The Living Bird Quarterly* invite you to write to us expressing your views on our content or other issues involving birds and the environment.

We reserve the right to edit your letters for style and to use your name unless otherwise requested. Our goal is to establish a forum for your ideas and to address the topics that concern us all.

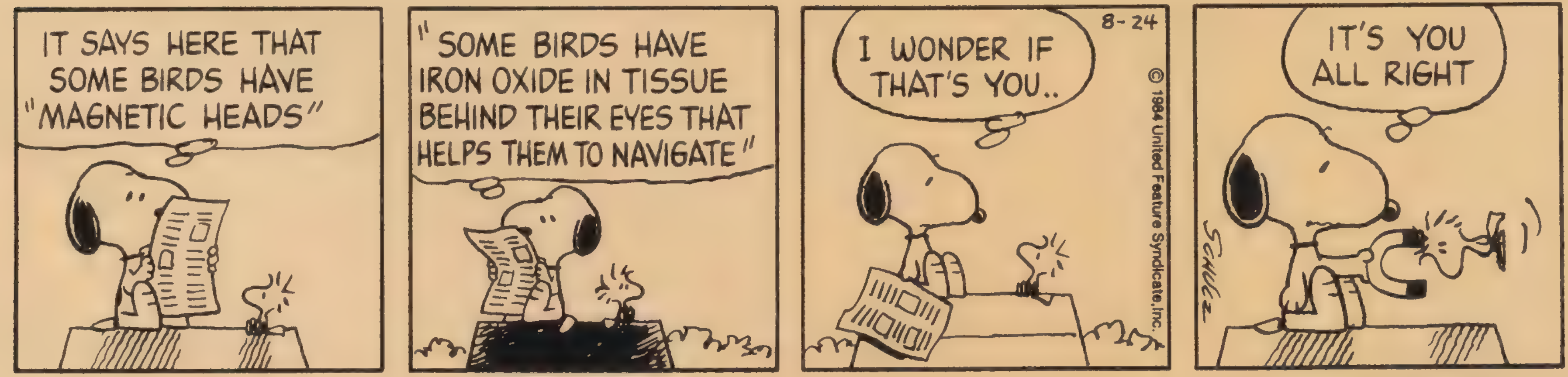
A NEW TECHNIQUE for marking thousands of birds at once has been developed by the U.S. Fish and Wildlife Service's Denver Research Center. Fluorescent paint suspended in a water-based adhesive is sprayed on a flock of birds from an airplane or is spread on a pond where waterfowl will land. The paint shows up on birds' feathers when held under ultraviolet light. The method requires that marked birds be captured and placed under the light before they molt or the paint wears off, a period of three to eight months.

According to researchers at the center, the technique has been tested on blackbirds with great success. Sixty percent of a roosting flock of 13-million blackbirds sprayed in Missouri in the winter of 1982 were adequately marked. Blackbird studies the next summer produced recoveries from as far as Edmonton, Alberta, with a recovery rate of over 10 percent. Conventional banding techniques in comparable cases usually yield less than one percent. Although this method does not allow recognition of individual birds, it has tremendous potential for studying movements of flocks, especially ducks and geese.

THE SIGNING OF the Wild Bird Bill by New York State Governor Mario Cuomo may be the beginning of a heated battle between conservationists and the pet industry. The bill, signed last August, prohibits the sale in New York State of any bird not bred in captivity. Supporters of the bill hope to pass similar legislation throughout the United States with the goal of shutting down the import of wild birds into this country.

For every wild bird sold in a pet shop, an estimated 10 to 100 die during capture, transport, and quarantine. Over 800,000 wild birds were legally imported into the U.S. in 1982 alone; as many as 80-million were captured for the U.S. pet trade that year.

The Pet Industry Joint Advisory Council is fighting the legislation since many of these birds, such as cockatoos and macaws, are popular pets that are not bred in captivity in


IT SAYS HERE THAT SOME BIRDS HAVE "MAGNETIC HEADS"
"SOME BIRDS HAVE IRON OXIDE IN TISSUE BEHIND THEIR EYES THAT HELPS THEM TO NAVIGATE"
8-24
I WONDER IF THAT'S YOU..
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large numbers. New York State is the third largest market for wild birds in the U.S., after California and Florida. The bill takes effect November 1, 1985.

ARE YOU INTERESTED in the birds of England? Mr. D. A. Lee of Lincolnshire is looking for someone to write to about English birds and bird watching in exchange for information about this country. He has been a member of the Royal Society for the Protection of Birds for 15 years, is a regular participant in bird surveys in his area, and is very knowledgeable about the history of his region. Anyone interested in communicating with Mr. Lee may write to him at: 15 Thames Road, Grantham, Lincolnshire, England.

THE 19TH INTERNATIONAL Ornithological Congress will be held in Ottawa, Canada, June 22 to 29, 1986. The program comprises lectures, symposia, papers, round-table discussions, special interest group meetings, and workshops. Pre- and post-congress excursions and workshops are planned, as well as early morning bird walks.

Deadline for registration and submission of papers is January 1986. Additional information and registration forms are available from: Dr. Henri Ouellet, Secretary General, XIX Congressus Internationalis Ornithologicus, National Museum of Natural Sciences, Ottawa, Ontario, Canada, K1A 0M8.

NATIONAL WILDLIFE Federation's 1984 mid-winter bald eagle survey found 11,819 eagles in 42 states, compared with 10,903 in 1983. Nesting surveys from the Great Lakes to Maine and south to Chesapeake Bay show a slow but steady increase in nesting pairs of eagles for the past ten years.

THE NUMBER OF endangered and threatened bird species found in the United States now stands at 76, according to the U.S. Fish and Wildlife Service. The wood stork was the only bird species added in 1984. Least terns and piping plovers were proposed for the list, while the status of the Arctic peregrine falcon dropped from endangered to threatened, and the removal of the southeastern population of the brown pelican from the endangered list was proposed.

Worldwide, 220 bird species are considered threatened or endangered, as well as 297 mammals, 99 reptiles, 85 plants, 62 fish, 24 clams, 16 amphibians, 12 insects, nine snails, and four crustaceans.

U.S. FISH AND WILDLIFE Service has proposed that the piping plover be added to the list of threatened and endangered species. Piping plovers breed on Atlantic coast beaches from the Maritime Provinces to North Carolina, on some shores of the Great Lakes, and in suitable wetlands and rivers in the Canadian prairie provinces, Montana, Nebraska, and North and South Dakota.

Human disturbance and development of beach areas are responsible for the species' decline. Throughout their range the plovers usually are incubating eggs by Memorial Day weekend when interference from beachcombers, sunbathers, and dune buggies causes the failure of most nesting attempts. The Atlantic coast population now numbers fewer than 800 breeding pairs. Fewer than 20 pairs remain in the Great Lakes, where the species is proposed for endangered status.

FOR THE FIRST TIME in its 47-year history, Ducks Unlimited will be spending several million dollars annually to protect and restore waterfowl habitat in the United States. Until this year DU has directed its funding to projects in Canada, where 70 percent of all North American waterfowl breed. During that period DU restored or preserved more than three million acres of waterfowl habitat. DU also has appropriated funds to protect 50,000 acres in Mexico.

The organization reports that only an estimated 95-million acres of wetlands remain of the original 215-million wetland acres in the United States, and that wetland loss continues at a rate of 458,000 acres per year. Plans have begun on projects in North and South Dakota, Minnesota, Montana, and Alaska, where 90 percent of all ducks hatched in the U. S. originate.

THE LABORATORY has acquired a limited number of complete sets (some imperfect) of *The Living Bird* annual. Sets are available for $1,000. Nineteen volumes of *The Living Bird* annual were published by the Laboratory between 1962 and 1981, and contain a variety of significant research studies as well as handsome colorplates. Proceeds will support the Library. Mail your request and check or money order to Library, Laboratory of Ornithology, Cornell University, Sapsucker Woods, Ithaca, New York 14850.

MEMBERS: thank you for your tremendous response to our year-end letter and your continued support of the Laboratory. We received more than 200 letters with donations totaling over $30,000. With Laboratory membership topping 10,000 and new programs under way, 1984 was a very good year for the Laboratory.

Dear Member:

Warblers are challenging. They are hard to see, difficult to identify and, it turns out, a sound engineer's nightmare. Four years ago we began a project with William Gunn, Donald Borror, and the Federation of Ontario Naturalists to produce a new, comprehensive recording of the songs and calls of all North American warblers. Now, after much agony, we finally can enjoy superb recordings available on both records and cassettes. What took four years?

Of all birds, warblers are the hardest to record. Their songs are full of high frequencies and the notes have incredibly abrupt beginnings. Recording equipment is designed for human speech and music—even the most sophisticated systems cannot cope with a virtuoso performance by a half-ounce blackpoll warbler. The results can be horribly distorted sound reproduction.

Fortunately, the original recordings made by Gunn and Borror in the field were skillfully made with excellent equipment. But copies made of the tapes were distorted, and the problem was amplified on a test record. The first edition of the warbler album, produced in 1959, sounded splendid by comparison.

This was taken as a direct challenge by our sound engineer David Wickstrom, and by Robert Grotke at The Groove Shop. Grotke's record-cutting studio is in an old firehouse in Clarence, New York, where we had worked with him on previous record projects. Together, he and David rebuilt and replaced the equipment, for example, recording amplifiers with a power capability of 100 watts per channel were replaced by ones capable of delivering 900 watts. But the increase in power could burn out delicate cutting heads, and new ones cost $14,200 each!

Friends of David and Bob in the record business also tried to cut the warbler records, unsuccessfully. However, midnight forays to recording research facilities, examinations of test records with an electron microscope, and consultations with the engineering departments of phonograph parts manufacturers, did produce new ideas for David and Bob to try.

Finally, success. The modifications eventually produced a recording that sounds like warblers, an extraordinary accomplishment. All of us who want to know more about warblers owe a great debt to the late Bill Gunn and to Don Borror who made the recordings, to Andrea Priori who edited the tapes, to Jim Gulledge who edited the booklet and to Steve Cobb who designed it, and especially to the extraordinary talents and persistence of Bob Grotke and Dave Wickstrom. The skillful blending of expert field recording with state-of-the-art engineering has produced a product of unprecedented quality and lasting value.

***Charles Walcott*, Executive Director**

RESEARCH & REVIEW

Richard E. Bonney, Jr.

NEW BOOKS

PRAIRIE WINGS by Edgar M. Queeny. 1983. Dover Publications, New York. 256 pages. $12.50 (paper).

If you are interested in waterfowl or bird flight you will enjoy this book, which actually is not new, but a reprint of a 1947 classic. Originally titled *Prairie Wings: Pen and Camera Flight Studies,* this volume was among the first to document photographically the mechanics of bird flight. The author, a naturalist and hunter, took the 270 black-and-white photos while observing ducks on the Grand Prairie of Arkansas, one of the nation's largest gathering places for migrating waterfowl.

Many of the photos are stop-action sequences showing ducks landing, taking off, flying, hovering, pitching and turning, crash landing, and more. In 1947 the photos were a technological breakthrough. By today's standards many of them are fuzzy and lacking contrast, nevertheless, they are still interesting and useful for understanding how ducks fly. Some photos are accompanied by pen-and-ink sketches that explain what the birds are doing.

Queeny's explanations of the mechanics of flight are not always clear, but overall his writing is elegant and entertaining. Especially enjoyable are introductory chapters that describe the natural history of the Grand Prairie, and concluding chapters about duck hunting and a beloved retriever named Grouse of Arden.

THE JOY OF BIRDING by Chuck Bernstein. 1984. Capra Press, Santa Barbara, California. 201 pages. $8.95 (paper).

This book will be of interest primarily to serious birders. It is a hodge-podge, partly because many of the chapters first appeared as articles in *Bird Watcher's Digest.* The chapters are of two types: anecdotal accounts of birding trips, and discussions intended to help the reader become a better birder.

Many of the 13 anecdotal chapters are adventure stories that make enjoyable reading if you don't mind a somewhat clichéd writing style. The seven concept chapters are different: they contain information on topics such as prudent use of field guides; identifying immature birds; learning about bird distribution, and the significance of subspecies. The information is useful although somewhat disorganized. An additional chapter, "taking a guided bird tour," should be helpful to persons planning their first tour.

MATCHING MARTINS

Male and female birds of many species do not look the same. Often the male is brightly colored and the female is drab. Male purple martins, for example, are glossy purplish black, while females have dull blue backs and gray underparts. Presumably the male's bright color helps him to attract a mate and defend the nest against other martins; the female's dull color makes her less conspicuous as she tends the nest.

Yet not every drab martin is a female. Immature purple martins, both male and female, also have gray breasts. Why should young males resemble their mothers instead of their fathers?

Charles R. Brown of Princeton University has a theory: immature males may resemble adult females so that youngsters can gain access to food, preferred perching sites, or other resources normally reserved for females. His idea is based on behaviorist Susan M. Smith's suggestion that adult females may dominate males during the breeding season to ensure that females obtain enough food to produce eggs and healthy young. If this is true, Brown reasons, young, nonbreeding males may resemble adult females in an attempt to fool adult males into giving up resources.

Brown formulated this theory while studying a roost of 1,500 purple martins perched along utility wires in Green Valley, Arizona ("Light-breasted purple martins dominate dark-breasted birds in a roost: implications for female mimicry." *The Auk,* vol. 101, pp. 162–164). It was breeding season, the most likely time for females to dominate males. Brown noticed that gray-breasted martins frequently displaced adult males from perching sites along the top utility wires. However, adult males seldom displaced gray-breasted birds. Displaced males usually left the roost or settled upon the less-populated lower wires.

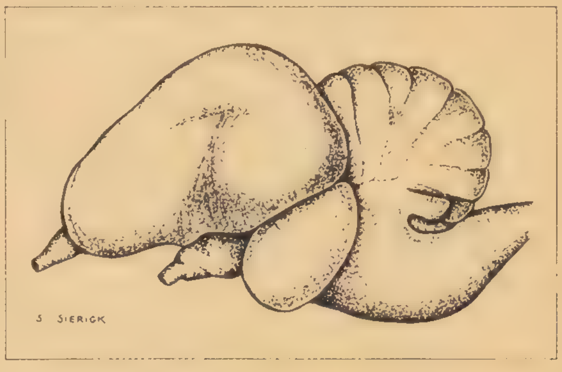
Brown feels that some of the gray-breasted birds probably were immature males which had deceived adult males and gained access to the uppermost wire. Why should this wire be favored? Perhaps it affords a better view of passing prey and approaching predators. A higher perch also might allow a martin to launch into flight and gain altitude more quickly, an important advantage for avoiding predation.

BIRD BRAINS

A new discovery has startled scientists worldwide: large numbers of neurons (nerve cells) are formed each day in the forebrains of adult birds. This finding contradicts the long-held belief that no new neurons are ever formed after infancy except in certain fish and rodents.

The discovery was made by Fernando Nottebohm and his colleagues at Rockefeller University ("New neurons form in adulthood," *Science,* vol. 224, pp. 1325–1326). Nottebohm has been studying canary brains for 15 years in an attempt to understand how birds learn songs. Early in his experiments he determined that a section of the forebrain called the HVc is an important part of the neural circuitry that controls singing. He also discovered that as young canaries learned to sing, or as adults added more songs to their repertoires, their HVc's grew. This finding led to an interesting question: did the larger size result from the birth of new neurons or from the growth of old ones?

By using a radioactive cell marker, Nottebohm demonstrated that as the HVc grew in several test canaries, new neurons appeared at a rate that would double their number in 49 days. Nottebohm further discovered that several areas other than the forebrain also acquire new neurons; he estimates that canaries may form as many as 20,000 new neurons a day. To make room for these new brain cells an equal number die, so there is a constant turnover of cells. Nottebohm also has discovered new neurons in the brains of budgerigars and ringed turtle doves.



Generalized bird brain

The implications of these findings are intriguing. Says Nottebohm: "We ought to see if adult neurogenesis occurs in humans. And if not, why not? What is preventing it? Can it be induced?" Perhaps studies of bird brains will lead to techniques for inducing new brain cells to grow in humans who have suffered brain damage.

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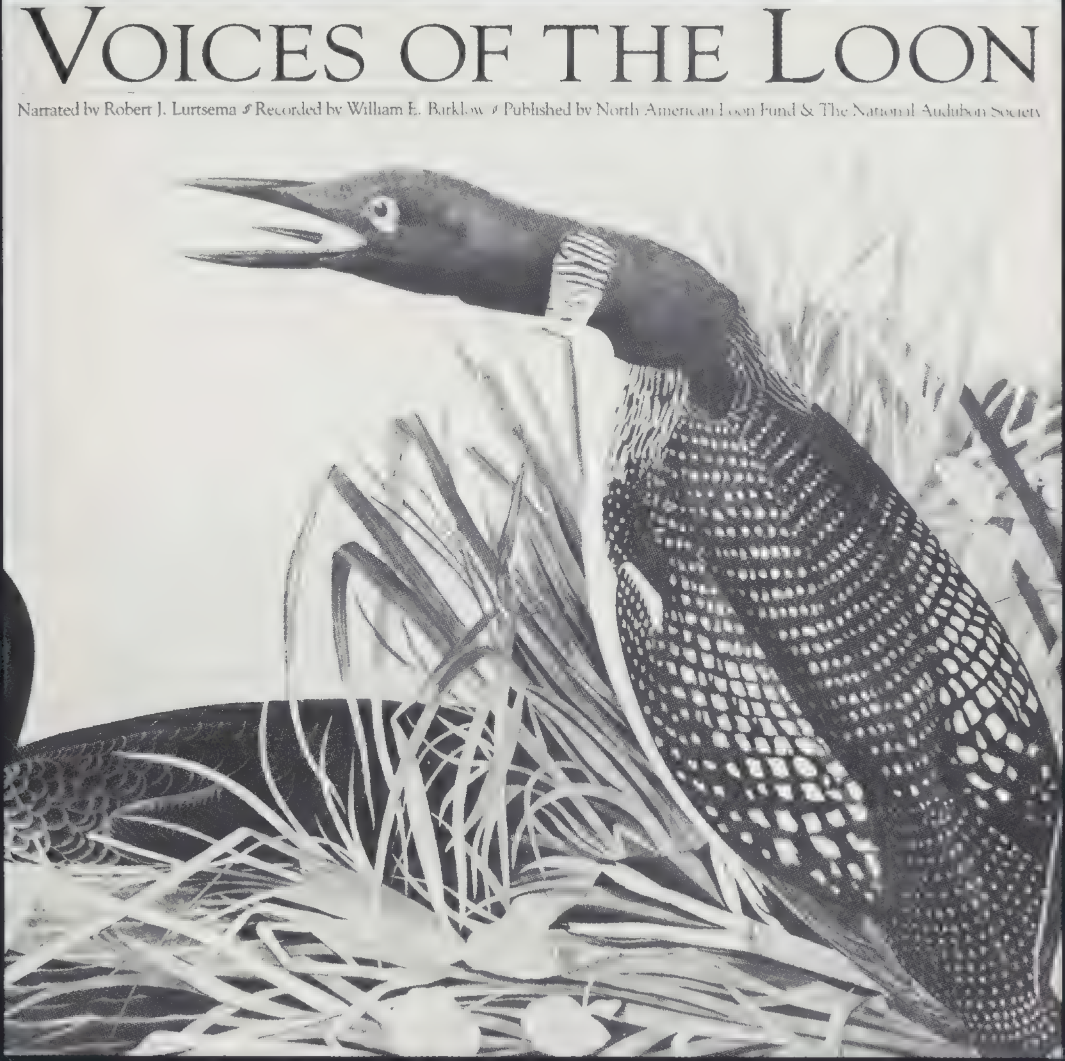
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Detailed account of the Atlantic puffin covering all aspects of this seabird's life history, current situation and threats. Contents include the puffin's morphology, distribution, breeding biology, feeding, colonies, young, predators, migration, and factors influencing its numbers. Over 40 maps and diagrams plus drawings and black-and-white photographs complete this readable book.

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Enclosed is a check or money order in U.S. funds, payable to The Crow's Nest Bookshop. Our address—The Crow's Nest Bookshop, Laboratory of Ornithology, Cornell University, Sapsucker Woods, Ithaca, N.Y. 14850. (607) 256-5057.

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Hypothesis Game

Thomas C. Grubb, Jr.

WHEN YOU RECEIVED your first field guide or attended your first bird-watching expedition you probably were a little bewildered. You never knew there were so many kinds of sparrows or realized robins were so big. Over the years, though, you've become acquainted with field marks and have sharpened your powers of observation. Sorting out ring-necked ducks from greater scaups is no longer difficult. You can distinguish between hairy and downy woodpeckers. Even small shorebirds and fall warblers are no longer mysterious.

Now what? You've seen all the birds in your area. If you go to Africa and treble your life list you'll deprive your children of a college education. What can you do to bring a new dimension to your bird watching? You could play the hypothesis game.

Here's how it works: formulate a hypothesis about a particular bird or group of birds and then, either by using a field guide or going into the field, test the hypothesis. Here are some hypotheses you can test by looking through a field guide: female birds are less colorful than males; forest birds are always brighter than open-country birds; juveniles always resemble females in color, never males; the higher the latitude, the more seabird species and the fewer land bird species; more species have ranges ending in Kansas than anywhere else in North America; bills and legs of shorebirds are always the same length.

A while back I spent a day with some friends watching water birds. After satisfying ourselves that the black-bellied whistling ducks we were looking for weren't present, we sat in the sun on an old log eating our sandwiches, wondering why so many wading birds have white feathers. Great egrets, snowy egrets, immature little blue herons, all have white plumage. One friend speculated that white feathers might help the birds catch fish if the feathers reflect the blue sky into the water, causing the white bird to match the background. Someone else chimed in that if white feathers evolved only to fool fish, then all white birds should be fish eaters.

We leafed through our field guides, calling out the names of white-feathered species and what they eat. White-tailed tropicbirds eat fish. White pelicans eat fish. Gannets eat fish. It looked good so far. Then we came to the swans. They're white, but they are vegetarians. So much for our hypothesis.

We theorized further: maybe white feathers are possessed by birds that eat any aquatic prey, not just fish. This would take care of the swan problem. Off we went through the field guides again, but not far. Snow geese are white yet graze on land. We concluded that we did not have a firm idea why some birds are white, but we were sure it is not solely because they eat aquatic food.

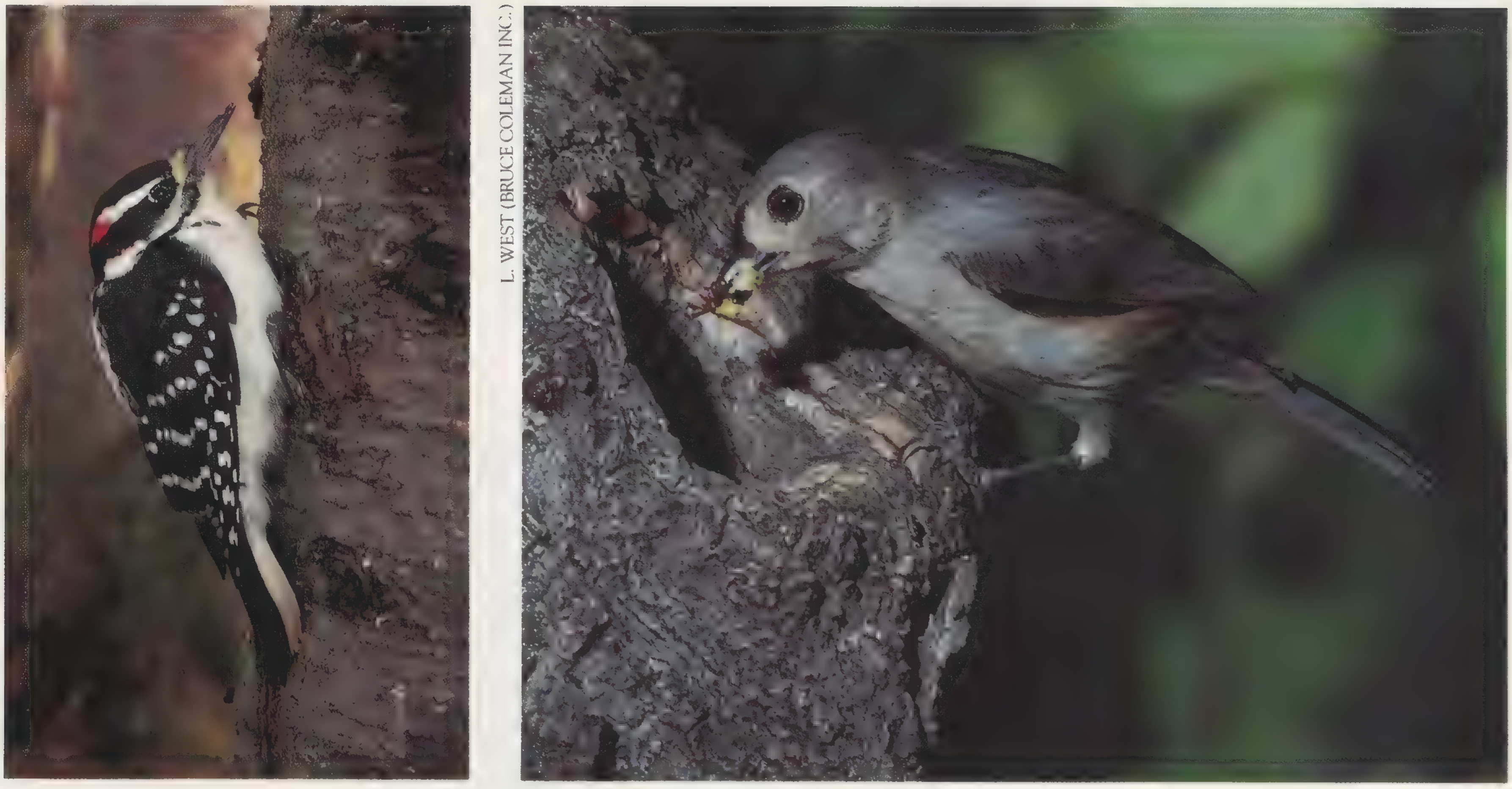
What about hypotheses you can test in the field? One activity you are likely to observe a bird doing is eating. Over the past several decades, many ornithologists have reported that different species living in the same place have varied foraging habits. Brown creepers search bark crevices for insects and insect eggs; woodpeckers drill deep into tree trunks; chickadees feed heavily from twigs, and warblers concentrate on leaf surfaces. In this fashion, the species divide food resources of their habitat and possibly reduce competition so they can coexist.

Current thinking suggests that even the two sexes of the same species may forage differently to promote coexistence in the same area. Can we test this idea? Let us formulate a hypothesis: male and female white-breasted nuthatches look for food at different heights in the same woodland. That is a working hypothesis which you can test with field observations.

First you must be sure you can dis-

Did white feathers evolve just to fool fish? No: white pelicans, left, are fish eaters, but trumpeter swans, above, are vegetarians.

PHOTOS: PELICANS—CHARLES G. SUMMERS, JR. (BRUCE COLEMAN INC.), SWAN—WAYNE LANKINEN/DRK PHOTO



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Different species that feed on similar prey may forage in different ways. Left, hairy woodpecker and, right, tufted titmouse, both feed on insects found in tree trunks, but the woodpecker probes below the bark while the titmouse gleans prey from surface cracks.

criminate between male and female white-breasted nuthatches. After some practice with binoculars, you should be able to distinguish the shiny, coal-black feathers of the male's cap from the duller gray crown of the female. The best conditions are bright sunny days. A male and female nuthatch usually forage together as they move through the territory defending against others of their species. This bit of natural history is useful. If you can sex one bird of the pair, you can assume the other bird is the opposite sex.

Walk through the woods searching for nuthatches; you will find most pairs by listening for their calls. Be sure to locate both male and female. When you have both sexes pinpointed, record the estimated height above the ground that they are foraging. You will want information on as many pairs as possible. To give statistical validity to your observations, allow at least one minute between observations from a single pair, and do not take more than five observations in a row on the same pair. Exclude cases where either bird is resting or preening; both must be foraging.

After about 50 observations, calculate the average foraging height for each sex. If there is a difference of several yards between the heights of each sex, you have supported the hypothesis that white-breasted nuthatches have sex-specific foraging behavior. If the two sexes differ by only a few inches, the difference could be due to chance.

Your results will be particularly interesting because the foraging of white-breasted nuthatches appears to vary depending upon region and habitat. For example, we know that in a ponderosa pine forest in Colorado, females foraged higher in trees than males, whereas in a deciduous woodland in Ohio, the two sexes used the same heights. More observations from different parts of North America, and from deciduous and coniferous forests, may confirm or refute these findings.

This hypothesis has been concerned with foraging differences between the sexes of one species. The same approach can be used to compare the foraging of different species in the same area. Do downy woodpeckers forage higher than hairy woodpeckers? Are the branches inspected by chickadees of a smaller diameter than those used by tufted titmice? Are the branches used by kinglets even thinner?

Besides looking at foraging locations, you can watch for differences in foraging techniques, which ornithologists speculate also help birds to allocate resources. For example, in the White Mountains of New Hampshire, red-eyed vireos and rose-breasted grosbeaks forage at about the same height, and on the same types of branches. However, vireos tend to capture prey by hovering against leaves, while the grosbeaks find prey by walking slowly along branches. Presumably, the varied foraging techniques allow the birds to capture different prey.

With that in mind, here are more hypotheses you might test: male and female downy woodpeckers drill holes of similar depths; male white-breasted nuthatches move upward on trees as frequently as do females; black-capped chickadees and tufted titmice use similar techniques when foraging on similar-sized branches.

These are just a few ideas to get you started. As you begin formulating your own hypotheses you'll think of new questions. You'll probably find that you don't have to go to Africa to add enjoyment to your bird watching. And if you ever do go, you can play the hypothesis game there, too.

FURTHER READING

Stokes, Donald W. *A Guide to Bird Behavior.* Little, Brown and Co., Boston. 1979.

Stokes, Donald W. and Lillian Q. Stokes. *A Guide to Bird Behavior, Volume II.* Little, Brown and Co., Boston. 1983.

THE AUTHOR

Thomas C. Grubb, Jr., a professor of zoology at Ohio State University, is currently a visiting scientist at the Edward Grey Institute of Field Ornithology, University of Oxford, England.

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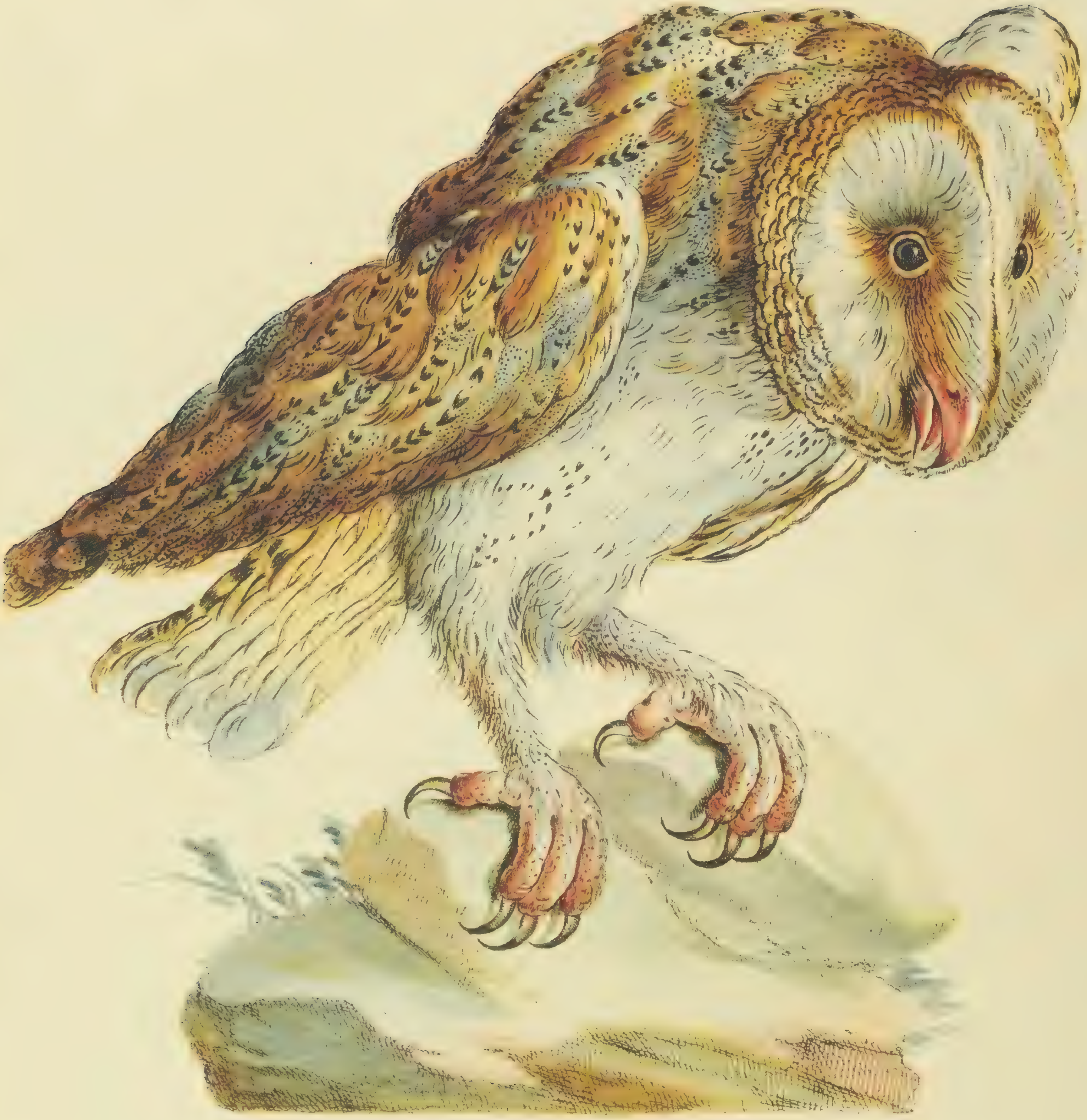

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Quarterly

Summer 1985

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Front Cover. White-tailed ptarmigan. Photograph by John Shaw.

Back Cover. Outside—Burrowing owl in southern Florida. Most owls can turn their heads three-quarters of a full turn. Photograph by Joe and Carol McDonald. Inside—Stamps from the Laboratory collection.

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While the pros and lucky amateurs are taking beautiful bird photos, a student in the Laboratory's home study photography course is struggling to attain mediocrity.

Parrots for Sale

DONALD BRUNING

The curator of birds at the Bronx Zoo discusses the often fatal path an exotic bird must take on its way to the pet shop.

NEARLY EVERY DAY someone telephones the Bronx Zoo offering to donate a pet parrot. Unfortunately, we must turn down most offers. The zoo does not have enough space to hold all the birds. Although we maintain over 1,300 birds and exchange another 300 to 500 annually, accepting even a fraction of the 300-plus birds offered each year would put a severe strain on our facilities.

Most large zoos across the United States have a similar problem. Why? Each year people are buying hundreds of thousands of parrots as pets and then, for one reason or another, discarding them. The U.S. Fish and Wildlife Service (USFWS) recorded that over 800,000 birds legally entered the U.S. in 1982 alone. Another 50,000 to 100,000 are smuggled in annually in order to circumvent quarantine and regulations like the Endangered Species Act, the Lacey Act, and the international treaty called CITES (Convention on International Trade in Endangered Species of Fauna and Flora).

Why do people discard their pet parrots? Some reasons were explained to me by a young man who applied for a job at the zoo. He had worked in a few pet shops, and said that in good conscience he no longer could tell customers that a particular parrot would make a marvelous pet when he knew the bird had been sold five times in less than two years. The parrot, he said, would first sell for several hundred dollars. When the purchaser found that the bird didn't talk, or was noisy and messy, or that it bit people and destroyed furniture, he would return it and get $40 or $50 back. The bird then would be resold for another few hundred dollars. And this bird was one of the lucky ones.

Many imported birds die before they reach the pet shop. In fact, from one to 100 birds may die for each bird that actually becomes a pet. The birds succumb during capture in the wild, transport to this country, or in quarantine facilities.

Capture and transport. In the late 1970s Charles Cordier, a long-time animal collector for zoos, described a tropical forest in South America where pet collectors had been operating as an "animal desert where one could walk for miles and not hear or see a single bird."

Cordier was appalled by pet dealers who would arrange for local people to capture every bird in sight, a method that was cheaper than hiring a knowledgeable collector to capture specific species. The locals would be paid a few cents for each bird they caught. The exporter would then jam as many birds as possible into crates and ship them off without regard for the welfare of the animals. These operations were geared to maximize volume and profits.

This attitude greatly distressed Cordier, who pampered each animal he collected so it would arrive at the zoo healthy and well-fed. He also was careful what he collected so that his business would not have a significant impact on any wild population.

Cordier was particularly concerned about the commonest method of collecting parrots, cutting down hollow trees where birds are nesting. Birds that survive the fall are taken to be hand-fed by local people, who neither know what to feed them nor have the proper foods. Mortality of chicks is very high, and even older birds often cannot survive the transition or diseases they are exposed to when dumped into cages with hundreds of other birds.

From a long-term ecological perspective, the loss of chicks may not be the worst problem. More detrimental to many species is the destruction of suitable nest sites. Tree hollows take years to form, and species like the large macaws may spend many breeding seasons locating an acceptable hollow; when one is cut down, it may take years of searching for a new hollow before breeding can resume. This has become a critical conservation problem since populations of these birds are already threatened by hu-

At the April 1985 meeting of the party nations of CITES, two more species of macaw were elevated to endangered status. These are the scarlet and Buffon's macaws, close relatives of the red-and-green macaw (left).

A cockatoo worth $30 in Australia could be sold for $3,000 in the U.S. An Amazon parrot worth $10 in Mexico could be sold for $200 in Texas, $500 in New York.

man encroachment, and the list of endangered species is constantly growing.

Quarantine. Fifteen years ago it was not unusual for 50 percent of imported birds to die before they could be sold. At that time, birds were inexpensive and if one died, it could be replaced easily. It was common knowledge among importers, collectors and conservationists that between one and 100 birds died for each one that was captured successfully in the wild and eventually sold in a pet shop. Imports were approaching one million birds a year by 1971. This meant that millions of birds died to supply the pet market in the U.S. that year.

Then, in 1972, disease caused a change in the pet bird industry. The spread of exotic Newcastle disease carried by imported birds threatened the domestic poultry industry, forcing the United States Department of Agriculture (USDA) to impose quarantine requirements on all birds entering the U.S. Few quarantine stations existed and in those that did, most birds died during the 30-day quarantine period. Young birds did not receive proper care, and parasites multiplied and spread rapidly under the stress of transport and quarantine.

Because of the substantial loss of life, the number of birds imported dropped dramatically, and the price of the survivors skyrocketed. An Amazon parrot that cost $25 in 1971 sold for $500 in 1973. Meanwhile, birds continued to die in quarantine. Records from the

Thousands of parrots are imported illegally each year because the monetary rewards are so tempting. These include, clockwise from left, sulphur-crested cockatoo, blue-and-yellow macaw, red-lored Amazon, and scarlet macaw.

ROBERT E. PELHAM (BRUCE COLEMA

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It was common knowledge among importers, collectors and conservationists that between one and 100 birds died for each one that eventually sold in a pet shop.

USDA show that each year between 1976 and 1979, over 100,000 birds died in quarantine; the death rate ranged from zero to 100 percent.

Birds differ in their food and space requirements. Some species, such as trogons, hummingbirds and flycatchers, have difficulty surviving even under the best conditions. Other birds—certain finches, waterfowl and pheasants—have low mortality rates if given the proper care and space. Because of their ability to adapt to marginal care and their great appeal as pets, parrots have become the most popular imported bird.

Country of origin. Parrots imported into the U.S. from Latin America 15 years ago came mainly from Colombia, Guatemala, Mexico, Paraguay and Peru. With the imposition of quarantine requirements in 1972, and the passage of the Endangered Species Act and CITES in 1973, the pattern of importation changed. One by one the Latin American countries signed CITES and either restricted or prohibited the exportation of all or some of their wildlife. By the mid-1970s, Colombia had closed down most wildlife exports, especially parrots. By 1982, Bolivia had become the major parrot exporting country in Latin America, followed by Argentina, Peru, Guyana, Uruguay, Honduras and Ecuador.

Why are these and other countries,

Once taken from the wild, many waterfowl and pheasants are now successfully raised in captivity. These include Lady Amherst pheasant (left), golden pheasant (far left, above), and mandarin duck (far left, below).

including some CITES signatories, still exporting birds? The monetary rewards are too tempting to be ignored. For example, a cockatoo worth $30 in Australia could be sold for $3,000 in the U.S. An Amazon parrot worth $10 in Mexico could be sold for $200 in Texas, $500 in New York. As long as the market remains lucrative, exporters will find loopholes to get around the laws or ways to smuggle birds out of the country.

If a local government is concerned about its wildlife and has the ability to enforce its laws, trade may shut down temporarily. Typically, though, within a few years enforcement will relax or a new government will take over which has little concern for enforcing the wildlife laws of its predecessor. In the meantime, trade will have moved on to another country until it is shut down there. In this way the trade moves from one country to the next and frequently is reestablished in a country every few years. Only a few Latin American nations are stable enough to maintain control over a long period, and even then the laws are enforced sporadically.

Hyacinth macaws. According to U.S. Fish and Wildlife Service records, nearly 160,000 parrots were legally imported to the U.S. from Latin America in 1982. USFWS agents admit that a similar number entered illegally across the border from Mexico and across the Caribbean into Florida and Louisiana. Of the 160,000 legally imported parrots, over 13,000 were macaws, most of which came from Bolivia.

Included in the 13,000 were over 1,500 hyacinth macaws, which are of particular concern because their numbers are declining precipitously in the wild and the species is considered threatened. Hyacinth macaws are found primarily in Brazil which prohibits all wildlife exports. Officials in Bolivia admit that this species occurs in only one corner of their country and that the total population there is less than one-third the number being exported to the U.S. Bolivian officials realize that birds are smuggled out of Brazil into Bolivia for export, but they are unable to stop this activity.

The Bolivian government has made some progress, however. As of April 1984, most wildlife exports have stopped, and thousands of birds have been seized. The Bolivians have requested assistance in caring for these animals prior to their release into the

PETER B. KAPLAN (PHOTO RESEARCHERS, INC.)

Eight palm cockatoos, among the most valuable birds in the world, departed for Indonesia from John F. Kennedy Airport in New York on March 11, 1985. This was one of the few times that illegally imported live wildlife has been returned to its native country. They will become part of captive breeding programs.

The birds were among 103 palm cockatoos, valued at over a half-million dollars, that were forfeited by court order to the U.S. Fish and Wildlife Service after they were imported into this country in violation of Indonesian law and the U.S. Lacey Act. Entirely black except for red cheek patches, palms are the largest cockatoos, measuring up to 29 inches in length.

They were accompanied to Indonesia by Donald Bruning and upon arrival were placed in a captive breeding facility. Because the cockatoos were removed from the nest at an early age, experts advised against attempting to return them to the wild. It is hoped this nucleus flock will become a self-sustaining captive population of the species in Indonesia.

A formal breeding consortium has been established in the United States for the remaining cockatoos, following consultations among Indonesian and U.S. government officials, the American Federation of Aviculture, and the American Association of Zoological Parks and Aquariums. The group agreed a consortium was the most efficient way to establish a captive breeding flock of cockatoos in this country.

They are a slow-breeding species that seldom reproduces in captivity. Because of export restrictions from their countries of origin, including Australia and Papua New Guinea, there are very few palm cockatoos in the United States.

Hyacinth macaw (top) is threatened, yet about 1,000 individuals were smuggled out of Brazil in 1982. Parakeets (below) are a better choice for a pet because they are bred in captivity and needn't be taken from the wild.

E.P.I. NANCY ADAMS

TOM McHUGH (PHOTO RESEARCHERS, INC.)

wild. The New York Zoological Society, in conjunction with the Bolivian Wildlife Society, is providing funds for this purpose. Time will determine if the Bolivian government can continue to enforce its wildlife laws. If so, we probably will see another shift in the origins of wildlife exports from South America. Now Argentina, Guyana and Paraguay are the major exporters.

No exotic birds. Frequently people ask how dealers or pet shops acquire illegal animals. Once the animals have passed the entry point into the U.S., whether legally or not, they can be shipped and sold anywhere with little likelihood of anyone asking about their origin. The USFWS has only a few agents and simply cannot police all the pet shops. Periodically, however, agents are advised of questionable activities and may pursue individual cases. Some agents have made a significant impact.

A key to the protection of exotic birds is curbing the demand for them. The huge profits ensure that trade will continue until the American people insist that it be stopped and that our government enforce its wildlife laws. During the past few years the problem has worsened; enforcement by the Interior Department has declined because of lack of funds and a negative attitude toward upholding the laws. This trend is likely to continue unless pressure is brought to bear on U.S. officials.

I believe many citizens would not purchase exotic birds if they realized the birds' legal status was suspect and, more importantly, if they knew of the tremendous loss of animal life involved in capturing these birds. Potential pet owners in this country could save the lives of hundreds of thousands of birds if they bought captive-bred birds such as cockatiels, lovebirds and parakeets, instead of exotic birds, and insisted that national and international laws and treaties be enforced.

Donald Bruning is curator of the Department of Ornithology, New York Zoological Society, Bronx, New York.

Further Reading

Nilsson, Greta. *The Bird Business: A Study of the Commercial Cage Bird Trade.* Animal Welfare Institute, Washington, D.C. 1981.

ANTING ANTICS

ELOISE F. POTTER

Science will never know how many times the bacon burned while I recorded data.

ONE DAY IN MARCH of 1964, I was standing in my kitchen in Zebulon, North Carolina clearing the table after lunch. Glancing out the window into the backyard I saw five starlings standing on the ground beside an anthill. Each bird pecked the ground and with rapid, jerking movements, lifted one wing slightly, brought the tail forward, and tucked the head under the wing. The birds appeared to be in ecstasy, ignoring nearby disturbances and taking flight only when I approached very closely.

Puzzled for a moment, I soon realized what the birds were doing. They were anting, an unusual behavior I had heard about, but never expected to see in my own yard. I was certain that this had been a once-in-a-lifetime experience for me, so imagine my surprise when six months later I saw more starlings anting on two consecutive days.

Although I had no formal training in ornithology, I realized that I might be in a good position to examine the anting phenomenon. As a mother of four school-age children I could work the study of anting into the routine of preparing meals, doing the laundry, cleaning house, and caring for the children. Being a housewife makes it easy to study bird behavior because the house acts as one big bird blind, and housework permits thousands of observations throughout the year.

Not knowing where to begin, I wrote to the late B. Rhett Chamberlain, then an editor of *The Chat,* journal of the Carolina Bird Club. He encouraged me to try to discover why birds dress their plumage with ants, and suggested that the best method was to collect systematically as many first-hand observations of the behavior as possible. In addition he sent me a list of references on anting from the scientific literature and advised me to bone up.

The readings offered many hypotheses, but few facts. Explanations for anting included: transporting food during migration, providing sensual pleasure or sexual stimulation, increasing the flow of saliva during preening, removing stale oils from feathers, and increasing resistance to feather wear.

The most commonly held belief at the time stated that birds ant to rid themselves of ectoparasites—mites and ticks that infest skin and feathers. However, much of the published data supporting this theory had been collected from captive birds, where the researchers sometimes provided cigarettes and orange peels for use in anting. Agreeing with the late biologist and author Waldo L. McAtee, I considered studies of captive birds unsuitable for determining why wild birds ant.

Based on my reading I formulated

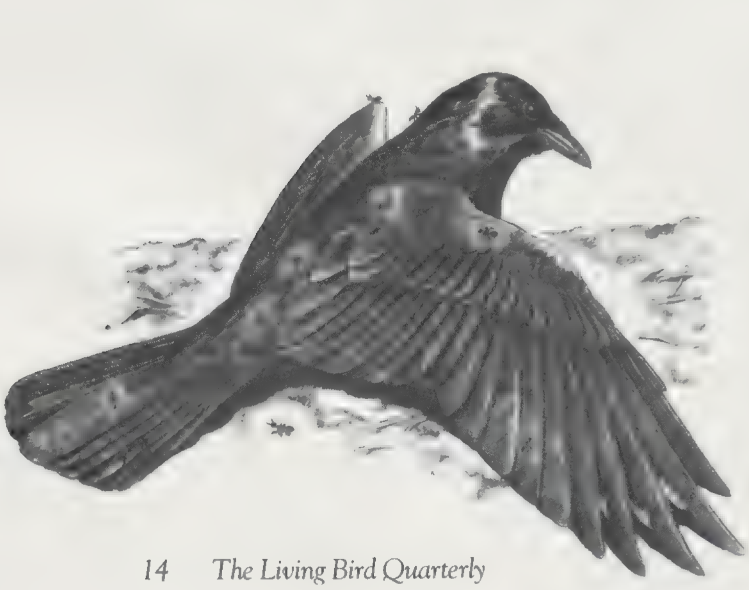
Besides applying ants to their feathers, birds groom in other ways. This greater roadrunner preens (right), and bathes in dust.

Some birds ant so vigorously they turn somersaults. Other birds ant passively, flattening themselves on the ground at an anthill or in the path of a moving column of ants.

specific questions I wanted to answer: (1) at what season of the year do wild birds ant most frequently, and (2) does the peak of anting activity correspond with the peak of ectoparasite infestation?

To gather data, I designated the yard as my study area. I noted the behavior of all birds within this plot at least once every two hours from six in the morning until dark almost daily for 29 months. A less formal study continued through 1972. When I saw birds anting, I recorded the number of birds, the species, age, sex, condition of plumage, time of day and duration of episode, temperature, sky conditions, and precipitation. I also noted related activities such as bathing, sunning, and dusting. Science will never know how many times the bacon burned while I recorded data.

In those nine years, I saw 26 episodes of anting, and virtually every variation on the theme. An actively anting bird may pick up ants one at a time or gather a beakful. The bird may crush ants and rub them on the feathers or hold live ants while they spray a defensive acid secretion. After a treatment, the bird may eat the ants or drop them on the ground, dead or alive. An episode may be one quick treatment or a bout lasting until the plumage is wet; most episodes last one to 10 minutes. Some birds ant so vigorously they turn somersaults. Other birds ant passively, flattening themselves on the ground at an anthill or in the path of a moving column of ants, allowing them to crawl into the plumage.



Anting may be performed alone or in groups. Other birds of the same or different species may watch an anting bird and, upon its departure, proceed to ant at the same site. Occasionally a spectator displaces the anting bird. Although it seems important to the birds that engage in it, anting does not appear to be essential to health. I believe that only a small portion of the avian population ants, which suggests that anting may be learned rather than instinctive.

On one particularly memorable occasion I saw a molting juvenile American robin sweep the ground with an oak twig that had several small leaves still attached. The bird held the twig in its beak and swept the ground by turning its head 180 degrees. After uncovering some ants in the leaf litter, the bird dropped the twig and anted. Then it picked up the same twig and went through the process several more times.

Besides American robins and European starlings, blue jays are among the species most frequently seen anting in North America, but other birds ant as well. They include thrushes, warblers, tanagers, finches, sparrows, blackbirds, and some nonpasserines, such as quail.

From my observations, I began to find some patterns, the most significant being that anting occurs most frequently when mites and ticks are *least* numerous on wild birds. This idea was corroborated by the studies of two other North Carolina housewives, Doris C. Hauser of Fayetteville and Elizabeth Pullman of Chapel Hill.

Mrs. Hauser was an authority on sunbathing in wild birds. When she died in 1972, her heirs gave me her notes and asked me to complete her unfinished manuscript on anting. Her records, combined with mine, provide a large body of data from a small geographic area: 73 anting episodes by 104 wild birds of 16 species.

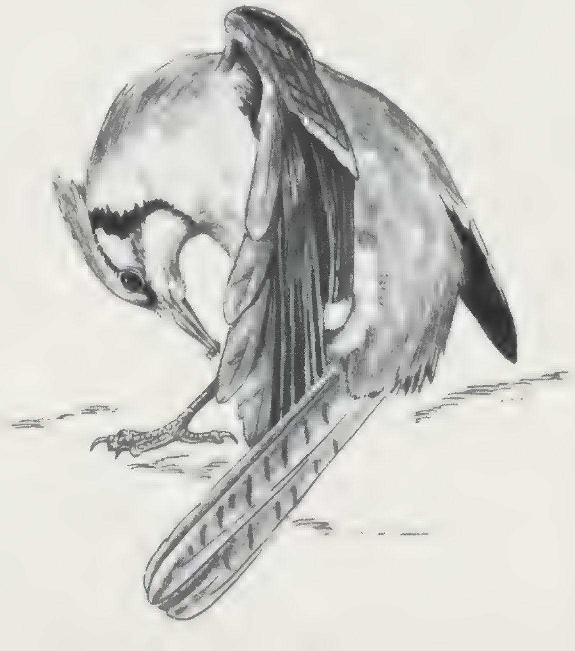
Mrs. Pullman banded more than 10,000 birds as a cooperator in the study of ticks as disease agents. She provided local data on molts and ectoparasite infestation. Together, the three of us have spent about 40 years studying grooming behaviors, molt cycles, and bird parasites.

Birds have been seen anting in North Carolina as early in the year as March 3 and as late as December 17. Major anting activity begins in mid-May and continues sporadically through the first week of October, with a sharp increase from late July through September. Preening, scratching, sunning, dusting, and bathing show the same seasonal trend.

Most birds that ant are passerines. What stage in their annual cycle corresponds with the period of mid-May through early fall? Checking the data, I noted that this is when many birds are molting. In North Carolina, postnuptial molt for many nesting passerines begins about mid-May. By mid-July, juvenile American robins have flocked and are in various stages of molt, as are many other young of the first brood. Also, I had observed that most anting birds showed signs of molting. The conclusion that birds ant mostly while molting was inescapable.

Why, if birds molt continuously during the warmer months, did I observe anting only sporadically? My weather data indicated that anting occurs mostly within 72 hours following heavy or prolonged rainfall, when birds in the process of molting experience a sudden loss of loose feathers. At such times I have often seen baldheaded or barefaced birds, ones with wide gaps in their wing feathers, and some with only two crooked tail feathers. These are the birds most likely to be anting. Apparently the ants secrete substances, such as formic acid, that are soothing to irritated feather tracts.

Birds also seem more likely to sunbathe during molting, although I have rarely seen an individual bird ant and sun in the same episode. Birds that are



Anting may be a method for birds to reduce discomfort due to molting; sunning, dusting and bathing may serve the same purpose. At right, a summer tanager bathes (above) and a common pheasant basks in the sun (below).

JEFF FOOTT

C. B. FRITH (BRUCE COLEMAN INC.)

molting wing, tail, lower breast, and belly feathers usually ant. Those molting head, neck, upper breast, and back feathers tend to sun. I do not have enough data to say at what stage of molt birds prefer to dust, but this activity usually takes place in sunny spots and frequently involves molting birds.

Anting, sunning, and dusting appear to be three methods birds use to relieve skin irritation caused by the rapid loss of feathers. Sunning is used for the tracts that cannot be reached with the bill. Ants are applied to tracts not readily exposed to sunlight. Maybe dusting birds itch all over.

Of course, my conclusions do not eliminate the possibility that anting serves other purposes as well, such as reducing ectoparasite infestation. However, several more pieces of information seem to further refute this idea.

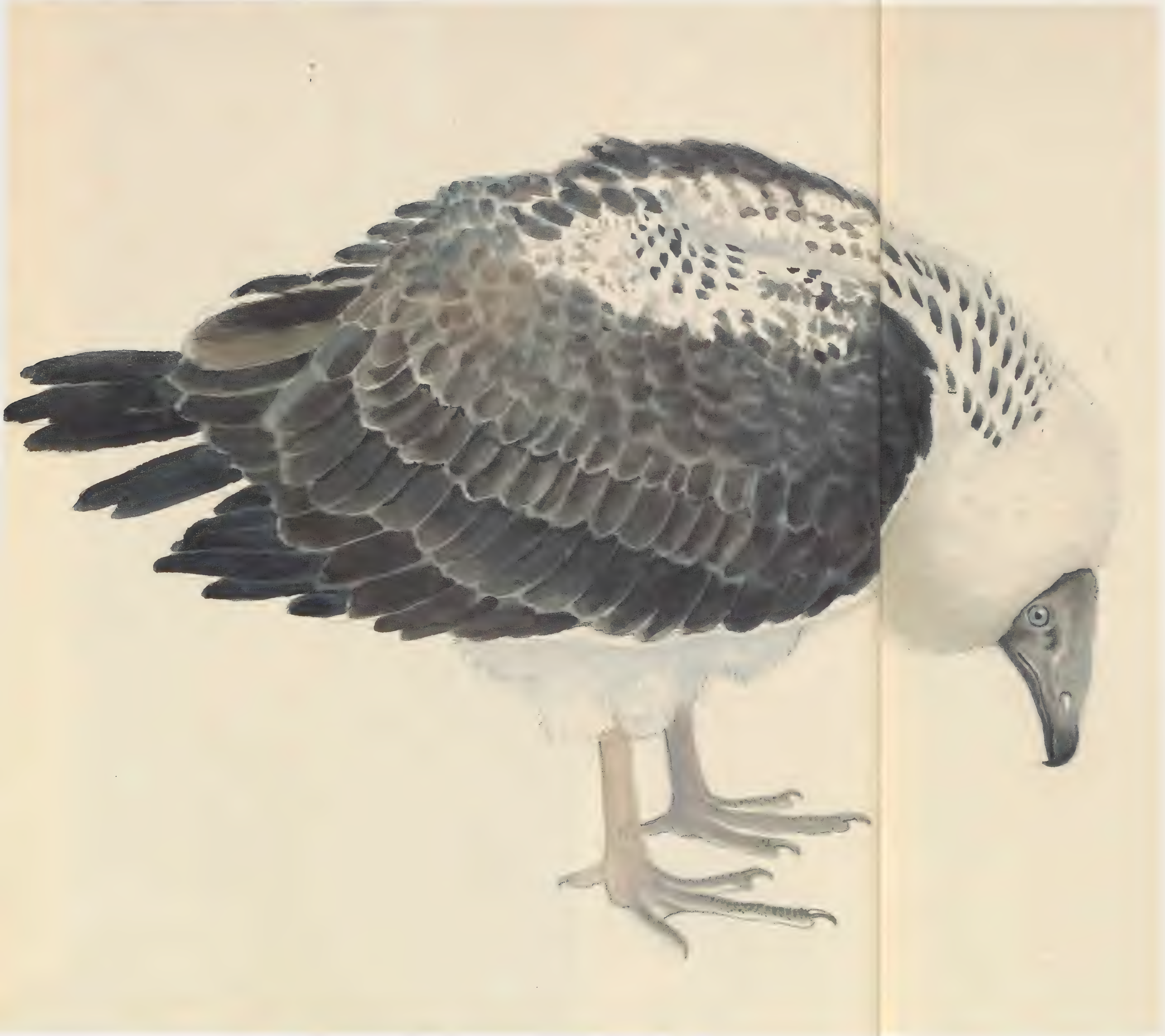
First, other researchers have noted that feather mites are most numerous before and after the molt, least numerous during the molt and in winter. Second, ticks tend to attach themselves to the ear openings or around the eyes of the host bird, both being regions the bird cannot reach with a beak full of ants. Third, in North Carolina, ticks are most common on avian hosts from November through April when birds rarely ant, even though ants remain active except during periods of extreme cold.

Relief from the discomfort of molting may be the answer to why birds ant. During the 14 years since this idea was first published, no one has offered contrary evidence. However, the relationship between anting and molting has not been tested in controlled experiments. Until that is done, or until similar data have been obtained from other continents, even I must say the mystery of anting has not been fully solved.

Eloise Potter is director of publications at the North Carolina State Museum of Natural History, editor of *The Chat*, and principal author of *Birds of the Carolinas* (University of North Carolina Press. 1980).

Further Reading

Potter, E. F. and D. C. Hauser. "Relationship of Anting and Sunbathing to Molting in Wild Birds." *The Auk*, vol. 91, pp. 537–563.



An Adventure with a Turkey Vulture

TEXT AND ILLUSTRATIONS BY GEORGE MIKSCH SUTTON

IN TEXAS WE LIVED in a big white house that stood on a hill southwest of the city of Fort Worth. About us stretched the rolling prairies, gay in summer with red and yellow daisies and the tall spikes of blooming yucca, and studded with clumps of prickly pear cactus and feathery mesquite trees.

Not far to the south of us the Trinity River slipped through a dense, low woodland. Here I spent much of my time, eager to watch, and capture if possible, the strange and interesting creatures which lived thereabouts. Flying squirrels built their globular nests of twigs high in the slender pecan trees. Chuck-will's-widows fluttered up from the leaves like gigantic moths. Raccoons and opossums searched for food along the banks of the slow-moving streams, leaving their neat lacy track patterns in the mud.

In the pale far sky drifted wide-winged, sable-coated turkey vultures, their pinions motionless for hours at a time as they ascended in slow spirals, breasted the wind, or swung low to the level of the treetops. I never ceased to marvel at their clean-cut outline, and the ease with which they handled themselves in flight. I was all unconscious, in those days, of the probability that centuries, ages perhaps, had slipped by while the turkey vulture was learning to conquer the air. It did not occur to me then that thousands upon thousands of the gaunt creatures had perished in the eternal struggle for survival, that those dreamily swinging spots of ebony might enchant me for an hour! Drowsily, majestically, unceasingly they drifted about, many just above the low-hung fluffy cloud masses, some gently moving amid the ribbed cirrus of the dizzy sky plains. Lying on the warm earth, I watched them. I could hardly think; I only dreamed myself a sky bird, a playmate of the clouds. I was vaguely, sadly conscious, perhaps, that while my race had for ages been developing my brain into an organ of doubtful utility, it had at the same time been reducing the length of my forelimbs, solidifying my bones—in short, condemning me to fourscore years and ten as a terrestrial being without the slightest glimmer of hope that I should one day spread my black wings and, rustling like heavy silk, mount to the blue. Never, never could I be a vulture!

I was roused from my reverie by the swish of dusky, stiff quills above me, as one of the vultures, made curious by my motionless, supine form, swung low. What a different creature! The naked head and pale bill were evil in appearance. There entered my mind the

George Miksch Sutton

STEVE SISNEY PHOTOGRAPHY

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thought that, had I been a corpse, that white beak would have sought with its hooked tip the innermost chambers of my heart! The plumage of the drab fowl was rusty and ragged; its wing tips spread out like slender, heavily nailed fingers! The vulture, close at hand, was a revolting creature. I shuddered because the vile body and macabre pinions had cast their shadow across my face.

Walking one day in the depths of the woodland, near a stagnant pool, I came upon a huge, partly decayed, hollowed log. Instinctively curious, I peered cautiously into the darkness, half expecting to discern the taut form of a wildcat crouched for a spring, or the lazy, pulpy coil of a water moccasin, white-mouthed and venomous. I could see nothing, though I strained my eyes. I went to the other end of the log, lay upon my side and peered through. From this position I could see light at the other end. The dim interior became more sharply defined. What was that strange shape? Was there a movement, just the slightest movement? Did I hear a noise? My back stiffened.

Then it dawned upon me that I was gazing at the silhouette of a turkey vulture—a mother bird, probably, sitting upon her eggs. Eager, fairly breathless, I dragged two large stones to one end of the log, closing the opening there, and instantly sprang to the other end of the log, half expecting to be greeted by a rush of wings. Assured that the bird was still within, I sat down. For a moment I pondered. The log was almost twenty feet long; I could not make the bird come to me by punching it with a stick, and there was danger of breaking the eggs. I could not smoke it out because I had no matches and I doubted my ability to start a fire by twirling a pointed stick against a piece of wood. My course was plain. I would have to go through the log.

I entertained certain misgivings. Could I force my way through the dark, moist tunnel? What would I encounter there? Would the mother vulture try to pick out my eyes?

Nevertheless I started, to find at once the aperture was not so large as it had appeared to be. Arms outstretched in front, hair and face scraping the musty wood, I inched forward, my toes digging doggedly into the earth. Within a short time the entire length of my body was inside the log. My face pressed against the wet wood; my body ached with the strain of the unnatural position, but I could not bring my arms back because there was no room for such movement.

Perhaps, after all, I should not attempt this strange tunneling! In a panic I tried to back out, only to find myself powerless. It appeared that in my toes, which could push me forward, was my only propellent power. I was doomed to stay, or to go ahead! I breathed hard, spent with exertion. There did not seem to be enough air in the place. My ribs were crowded. But I must go ahead! Digging my fingers in the soft wood, shoving forward with all the force of my feet, I made slow progress. A flake of wood somehow got into my eye. I could do little more than shed tears over this unfortunate happening, for my arms were so long that I could not reach my face with my fingers. And my handkerchief was in my trousers pocket!

The naked head and pale bill were evil in appearance. There entered my mind the thought that, had I been a corpse, that white beak would have sought with its hooked tip the innermost chambers of my heart!

I realized now, without question, that I should have not come into this log, that freedom of movement and plenty of fresh air were really all I had ever desired in the world. But I could not go back. Perhaps I remembered, in that dark moment, certain lines of Joaquin Miller's poem on Columbus. At any rate I squirmed on. I heard dull sounds as the buttons of my shirt gave way. My trousers stayed on only because of the strength of the leather belt, the straps of cloth which held it, and the endurance of my pelvic bones. The slipping downward of my shirt did not improve matters any. Wads of cloth seemed to be knotted all about my body.

I found myself wondering how much more an imprisoned, half-suffocated, tortured boy, miles from home, could endure, when suddenly I realized that the mother vulture and I were not the only inhabitants of this hollow log.

Tripping ever so daintily, his fine leg-threads just brushing the surface upon which he trod, came a grand-daddy longlegs, disturbed in his noonday sleep. A grand-daddy longlegs, considered impersonally, is an interesting creature. His legs are amazingly long and thin; his airy body is a strangely plump hub for those eight filamentous spokes which mince along so questioningly. I do not mind having a grand-daddy longlegs walk across my hand, in fact.

But to have a grand-daddy longlegs, and perhaps four hundred of his companions, suddenly decide to wander all over my face, neck, and back is another story. The first tickle of the advance guard's feet upon my nose drove me nearly frantic. I plunged my face into the wood, crushing my adversary. The odor of his body was unpleasant. Already his companions were bearing down upon me. I writhed and shuddered in exquisite torture. By waiting a moment, then wiping my face deliberately across the damp wood, I could kill or disable whole squadrons at a time. The situation was not improved by the fact that I could see only imperfectly in the dim light and because of the bit of wood in my eye.

Gradually the queer spiders learned that they were safer when they moved toward the light. I could see their dancing, trembling forms slowly withdraw from me. Nervous, full of reproach for my foolhardiness, I tried to relax, to think of something besides the vise in which I was fixed.

Was this soft thing my hand felt a fluff of milkweed down? Was it a bit of silk, so oddly out of place in this nether world? It was the nest of a pair of white-footed mice—dainty, bright-eyed little creatures whose noses quivered with terror, whose bodies shook with dread, as they felt rude fingers upon their nest. Frantically they rushed forth. Instinctively they leaped for the darkest crevice they could find. Owing to the effective stoppage of my end of the log, those havens of refuge were naturally near me. Trim, sharp-clawed feet raced over my back, under my shirt, about my neck. Can mice run nimbly? Can they use their toes in holding on? Do they learn of the unknown in the darkness through touching objects with their silken whiskers? The answers to these questions, and to many more, I learned within our hollow log. I was half afraid the jewel-eyed gnomes would bite my face or that one of them would pounce into my mouth as I strove to get a deep breath of air. Could all this torture be actual? Was I having a nightmare? Would it never end? One of the mice crawled between my body and the wood. I gave my shoulder a frantic shrug; there was a tiny squeak, and the sharp nails which had been digging into my skin instantly went limp. The other mouse lodged himself somewhere in the fold of my trousers. Poor little creatures! They had sought only the safety of darkness. They could have harmed hardly a living thing. But I am sure they wrecked a thousand nerve cells in my quivering body.

Again shoving forward violently with my toes and digging my fingers into the soft structure of the tree, I pressed onward. The passageway became larger; I moved more freely. It was heavenly to be able to rest my weary body, and to breathe more deeply.

But I was yet to meet my most amazing, my most uncomfortable adventure! Suddenly the mother vulture stood up, hissed, coughed a little, and began vomiting decayed flesh she had eaten earlier in the day. I had somehow forgotten the vulture. I found myself wishing with all my heart that I had not sealed up the other end of the log. Summoning courage, and wriggling forward as rapidly as I could, I struck the great bird an awkward blow. She hobbled off, hissing hoarsely and leaving a new object exposed.

I could not see very well; but I had enough strength and interest in my strange expedition to permit me to realize that I was face to face with a lovely newborn creature—a baby vulture, no more than a few hours old. It was downy white, its legs and naked head were gray, its infant eyes had no expression. Breathing evenly, quietly, it rested beside a large egg which was of soiled white splotched with blackish brown.

The mother continued to cough and hiss, but she could not produce any more food. I was thankful that the digestive process in birds is so rapid that food does not, as a rule, stay long in the crop or gullet!

Lifting the young vulture as well as I could, and rolling the big egg ahead of me, I wormed my way onward. The dusky parent retreated. At the end of the log I grasped her by the feet, pushed the obstructing stones away as well as I could, and breathed the fresh air in deep gasps. Nearly worn out, I trembled from head to foot. Most of my shirt was somewhere in the log; the underclothes which had covered my shoulders and chest were wound in tatters about my trousers. I was scratched up considerably, and bleeding in several spots. It must have taken me fifteen minutes to get out of the log, for the exit was small.

I found myself wondering how much more an imprisoned, half-suffocated, tortured boy, miles from home, could endure, when suddenly I realized that the mother vulture and I were not the only inhabitants of this hollow log.

When I finally reached the outer air I sank to the leaves, awkwardly tied the vulture to a sapling, using a shred of torn underclothing, and panted and trembled as I picked grand-daddy long-legs from my hair, eyes, and neck, and a dead mouse from my clothing. The belt had dug deep into the skin and had worn raw grooves all about my waist. But I was free! I could breathe the air, the cool, fresh air of heaven!

I hobbled over to the pool. In the rustic mirror I could see that I was no lovely vision. I washed my face and hands, smoothed back my hair, and pinned my torn clothing together with a thorn or two.

Then I returned to my captives. Somehow the little white baby seemed pitiably friendless in this bright world of the open. The eyes of the mother were hard and fierce and frightened. The egg was infertile. I could hear the liquid contents slopping about inside when I shook it.

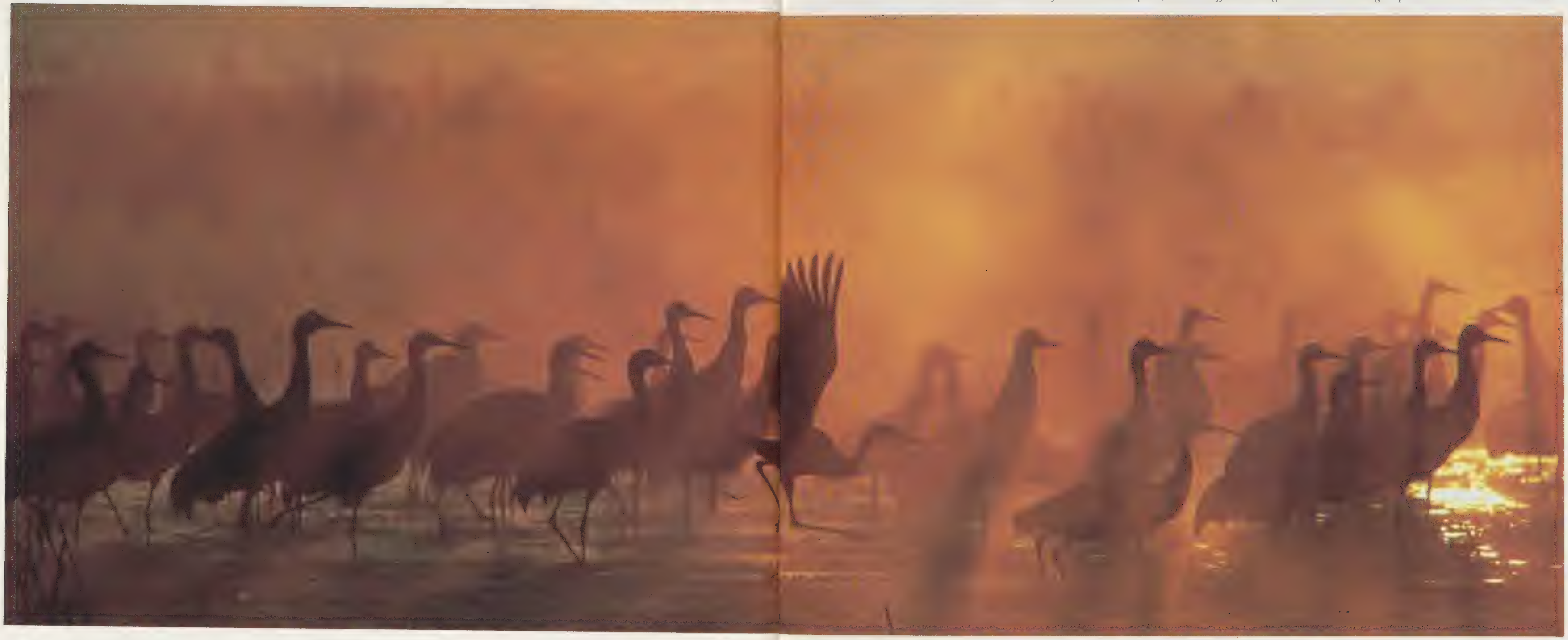
Had I been less weary or had my predatory instinct been more keen, I might have killed the mother vulture and tossed her aside; or I might have carried her home. But I couldn't bring myself to take that woods baby away, or leave it there an orphan. I put it back in the damp shadow of the hollow log. I rolled aside the stones I had brought for sealing the opening. And then I put the mother back beside the cottony infant. The mother bird did not attempt to rush away. Mouth open, she eyed me impersonally. I moved off through the woods quietly, hoping that my retreat would not frighten her, or that if she did fly away she would return to her charge.

I was famished and exhausted when I reached home. I mounted the stairs to my room with stiff and weary feet. When I took off my trousers a bright-eyed mouse whisked out of a pocket and scampered behind the bookcase.

George Miksch Sutton was one of the world's foremost ornithologists and bird artists. He was born in Nebraska in 1898, and began to draw and to collect birds when he was about seven years old. At 18, he studied with renowned bird artist Louis Agassiz Fuertes. In 1932 Dr. Sutton received a doctorate at Cornell University, after which he served on the staff of the Carnegie Museum in Pittsburgh, taught ornithology at the University of Pittsburgh, was Pennsylvania State Ornithologist, and Curator of Birds at Cornell. He joined the faculty of the University of Oklahoma in 1952, and later became its Curator Emeritus of Birds for the Stovall Museum and George Lynn Cross Research Professor Emeritus of Zoology. In his many years of research and painting he studied birds from the Arctic Circle to the jungles of Mexico, and authored 11 books. Dr. Sutton died in 1982.

"An Adventure with a Turkey Vulture" was first published in the June 1929 issue of *The Atlantic Monthly* under the title "Birdnesting under Difficulties." Later it was reprinted in *Birds in the Wilderness*, the Macmillan Company, New York. 1936; and *A Treasury of Birdlore*, Doubleday & Company, Inc., Garden City, New York. 1962. Reprinted here by permission of the author.

Our 1985 Photo Contest Winners



Wendy J. Shattil and Robert A. Rozinski, *Denver, Colorado. Sandhill cranes in sunrise fog, southern Colorado, February 1984. Canon F1, Canon 400mm lens, 1/500 at f8. "It's difficult to approach these birds at that hour of morning because they're about to leave the night roost," said Ms. Shattil. "And it's a challenge to get close enough to them at the same time the sun is coming through the fog. We were very lucky that year. At 20 degrees below zero, steam rose from the artesian pond, and the diffused sunlight transmitted through it produced the ethereal silhouettes."*

PHOTOGRAPHY is different things to different people. Arthur A. Allen, co-founder and first director of the Cornell Laboratory of Ornithology, summed up his feelings on the subject in the 1963 edition of *The Living Bird:*

"To me photography has always been a means to an end. Of course, I thrill to the sport of capturing on film a flock of teal as it whizzes by—and I still get satisfaction out of being the first to photograph an Ivory-billed Woodpecker or a Bristle-thighed Curlew. But in my case the camera has always meant the possibility of portraying accurately every species of bird, in every plumage and in every species-typical activity."

Allen was among the earliest ornithologists to use photography to verify the existence of rare species, and to document bird appearance and behavior. Through his photographs he was the first to determine that drumming grouse produce their reverberating sound by beating their wings in the air. Previously it was believed the birds either struck a log with their wings or beat upon their own breasts. Allen's book, *Stalking Birds with Color Camera* published in 1951 by the National Geographic Society, contains 331 color and 93 black-and-white photos of birds involved in virtually every known avian activity.

The late Ansel Adams is renowned for his pictures of natural landscapes. In *Portfolios of Ansel Adams* (1981), he illuminates a view of photography as an aesthetic and awakening experience:

"Both the grand and intimate aspects of nature can be revealed in the expressive photograph. Both can stir enduring affirmations and discoveries and can help the spectator in his search for identification with the vast world of natural beauty and wonder surrounding him—and help him comprehend man's continuing need for that world."

John Shaw, whose book, *The Nature Photographer's Complete Guide to Professional Field Techniques* (1984), contains many exquisite nature photographs, approaches his craft not just as a means to an end, but as an end in itself. In *Wildlife Photography: The Art and Technique of Ten Masters* (1982) by Ann Guilfoyle and Susan Rayfield, he says:

"Working with a camera is entirely mechanical and rather ritualistic. I remember that Hemingway, in the Nick Adams stories, described trout fishing in terms of ritual. Nick, coming back from World War I, had to order his world again, to give it meaning by the ritual of tying on a fly and casting it a certain way.

"A ritual is also involved in setting up a tripod, mounting the lens on the camera, selecting the shutter speed, f-stop, and so on. There is a certain beauty to this, a Zen, if you will. I think that's what I like most about the combination of natural history and photography. You must have both the mysticism and the technology, the Orient and the West, coming together to produce a good picture."

Today people the world over are using photography as a tool, an aesthetic pursuit, and a salubrious ritual. These folks are producing many excellent photographs, and the Laboratory of Ornithology's 1985 photo contest was designed to bring some of their work to the pages of *The Living Bird Quarterly.* In so doing, we hope to continue in the footsteps of Doc Allen by promoting photography as an excellent means of encouraging the understanding and appreciation of birds.

Special thanks to our judges, Les Line of *Audubon* and W. Allan Royce of *National Geographic,* and to you 400 photographers whose 2,000-plus slides and prints helped to make the *Quarterly's* first photo contest a rousing success. You contributed a wide range of bird subjects, from the Marabou stork of Zaire to the cardinal perched in a backyard tree. On the following pages, enjoy the work of the winners, and start preparing your entries for next time!

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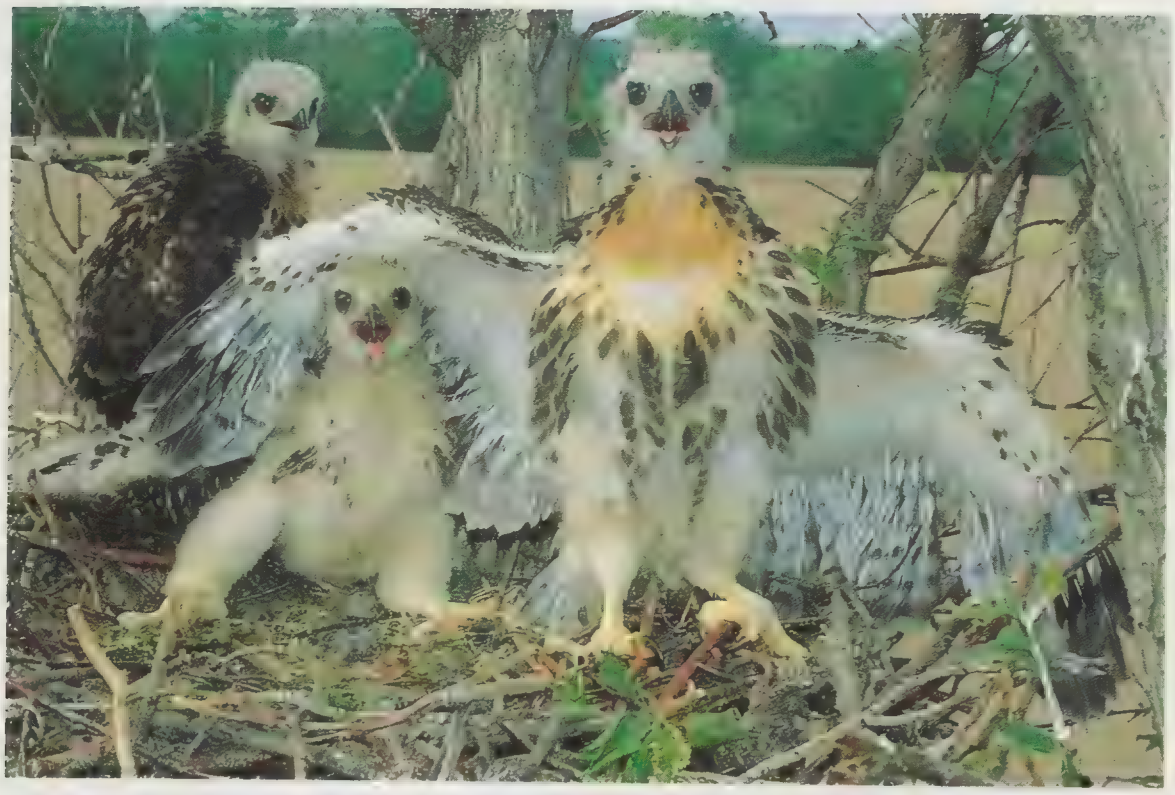
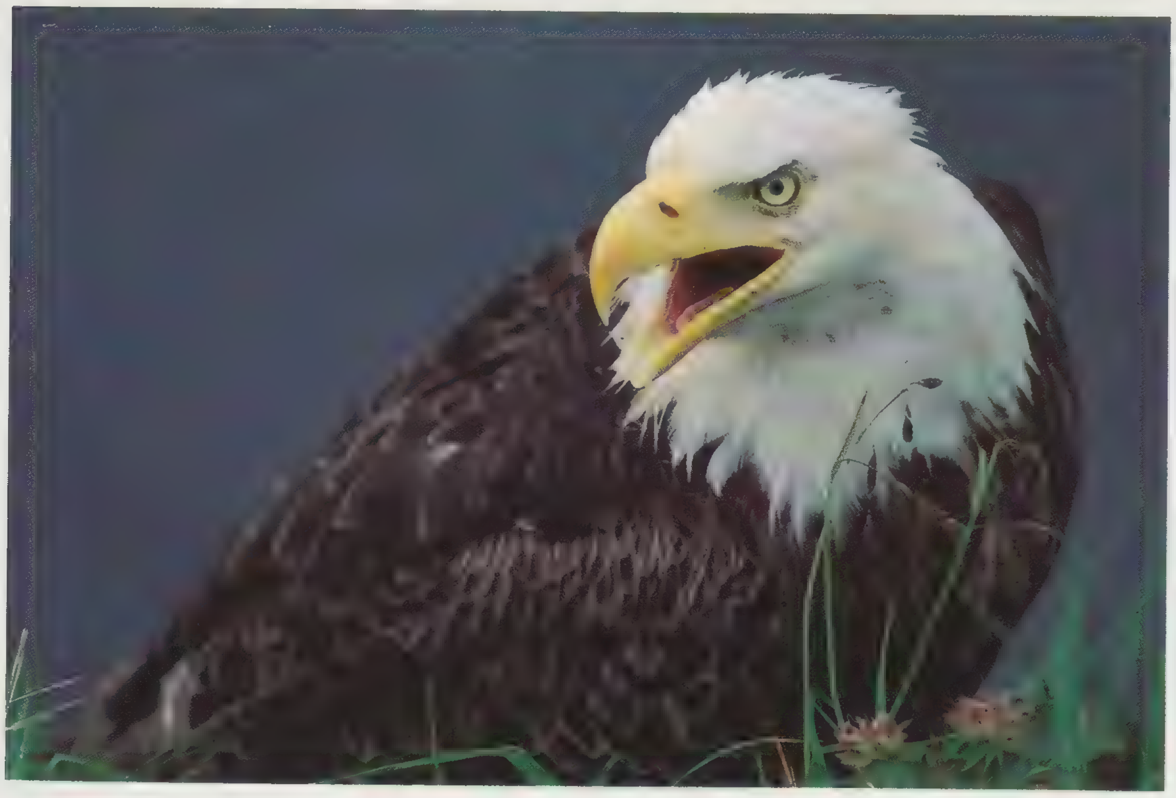


JAN R. HUUSSEN, *Rochester, New York. Red-tailed hawk trio, Seneca Falls, New York, spring 1981. Minolta XG7, 50mm lens plus electronic flash, 1/60 at about 3 feet.*

"Almost every year my wife and I venture out during spring to look for nesting birds. At a friend's home in rural Seneca Falls we searched farmers' fields for nesting birds and came upon the red-tailed hawk nest. For three consecutive Saturdays we traveled to Seneca Falls and each time I climbed 30 feet up the tree in order to obtain pictures of the nestlings during the various stages of their development."



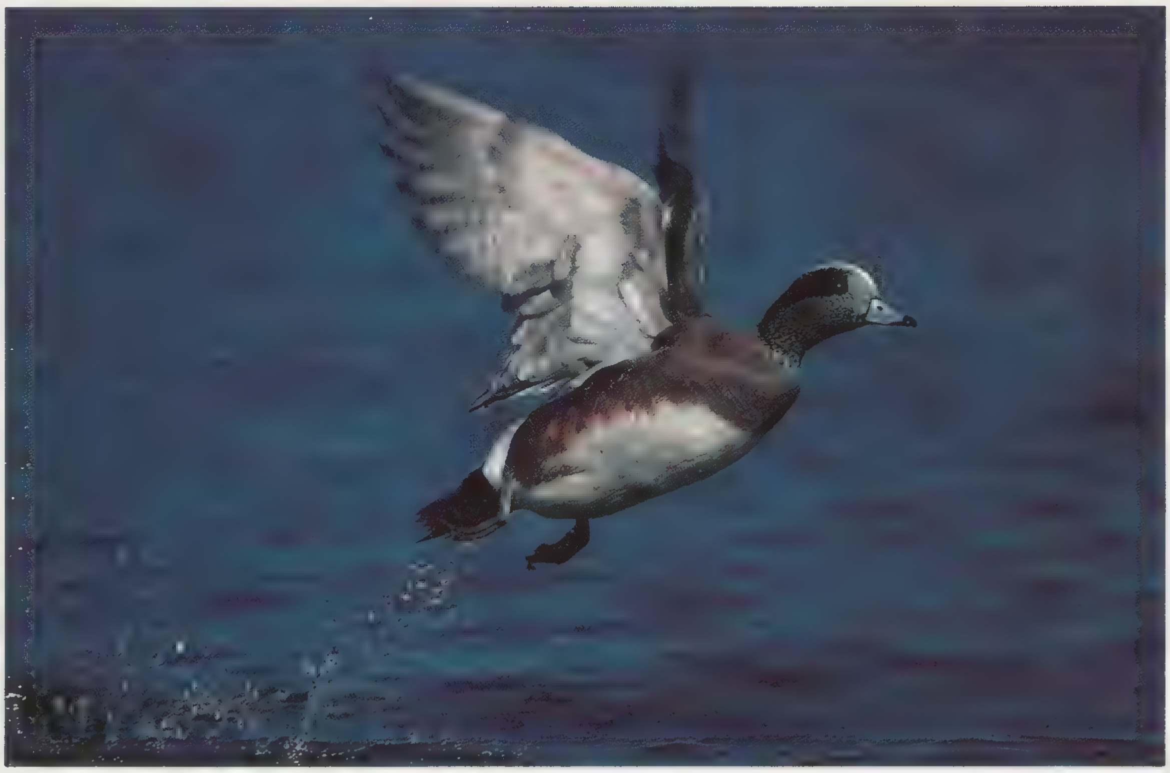
HAROLD E. WILSON, *Anchorage, Alaska. Bald eagle, Adak Island, Alaska, July 1984. Canon F1, Canon 600mm lens, 1/125 at f5.6.*

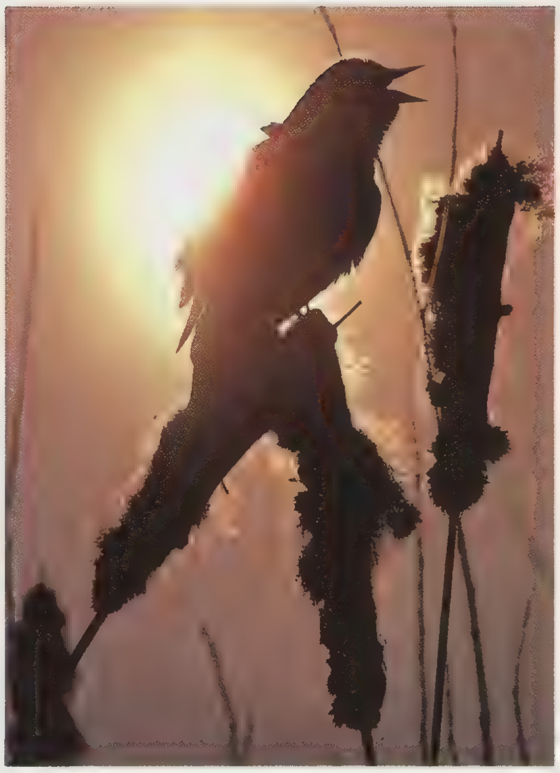
"I go fairly often to Adak Island in the Aleutians to take eagle pictures. There are no trees on the Aleutian Islands so the eagles have to nest on the ground; this one was sitting on a bluff near its nest. I took about 10 rolls of film over several days until all the elements came together. . . . My main profession is a bush pilot—I fly a small twin-engine mail plane around some of the Aleutian villages. My second job is wildlife photography. This summer I hope to take some pictures of the chicks."

PHILIPPE ROCA, *Lexington, Kentucky. Great horned owl, Owensboro, Kentucky, January 1982. Olympus OM1, 75-150mm lens, 1/60 at f4.*

"A friend of mine told me he had an owl in his barn so I rushed over to check out the photographic possibilities. After waiting an hour or two the bird was finally in the right position. Originally I wanted to take a picture of it looking out of the knothole, but those shots didn't work out as well as this one.

"I'm a tennis instructor and have been taking pictures for fun for five or six years. Recently, though, I built a bird blind and hope to be doing a lot more photography."





ROBERT A. ROZINSKI AND WENDY J. SHATTIL*, Denver, Colorado. Wigeon taking flight, Denver, August 1984. Canon F1, Canon 80-200mm lens, 1/1000 at f4.5.*

"We spent almost a full day at a park in downtown Denver trying to get this picture right," said Ms. Shattil. "We had been working on our technique for catching birds in flight when finally we and the wigeon did everything right. This hand-held shot froze the initial airborne motion of the bird in an unusual position. . . . We both have two full-time jobs: one is photography, the other is to make money so we can do the photography."

CARL R. SAMS II*, Ann Arbor, Michigan. Red-winged blackbird at sunrise, Ann Arbor, April 1984. Nikon F3, 300mm ED-If Nikkor lens with warm-up filter, 1/500 at f4.5.*

"This was taken in a marsh near my house. The male had been displaying and was agitated by my presence, and since I was standing in his territory, it didn't take long to get this picture in the morning light."

PRISCILLA H. CONNELL*, Fayetteville, Ohio. Snowy egret, Everglades National Park, Florida, January 1985. Nikon F3, 300mm lens, 1/500 at f8.*

"When we got to the Everglades this year, the place was alive with wildlife—I had never seen so many birds of all kinds at one time in one spot. Then, on the third day, a black panther appeared from out of the brush and grabbed a wood stork. Every bird took off and, except for a few ducks, not one came back for weeks. Fortunately, I had already taken this shot of the snowy egret as it stood in a pond at sunset."

A birder for many years, Ms. Connell came to photography later in life. "Once my children were grown I had enough time to take a nature photography workshop with professional photographers John Shaw and Larry West. After that experience I decided I was going to be a photographer when I grew up and I've been doing it ever since."

RESEARCH & REVIEW

Richard E. Bonney, Jr.

KENNETH W. FINK (BRUCE COLEMAN INC.)

Golden pheasant from China

NEW PHOTOGRAPHY BOOK

THE NATURE PHOTOGRAPHER'S COMPLETE GUIDE TO PROFESSIONAL FIELD TECHNIQUES by John Shaw. 1984. Amphoto, New York. 144 pages. $16.95 (paper).

Here is a beautiful new book written by an expert nature photographer. Shaw discusses many subjects of interest to bird photographers: how to make correct exposures under difficult lighting conditions; how to control mood with exposure; how to select lenses; how and when to use special equipment such as tripods, filters and motor drives; how to compose photos and control perspective, and how to cope with the rigors of field photography.

The text is clear and informative. Some topics are treated a bit superficially, such as using blinds and stalking subjects; however, brevity of text is offset by the profusion of excellent photographs. They are gorgeous—from crystal-clear close-ups to beautiful scenics to striking portraits of birds and other wildlife. They clearly illustrate the concepts and techniques discussed, and detailed captions explain how the photographs were taken. Also, many comparative photos are included—two or more shots of the same subject taken from different positions, under different lighting conditions, or with different equipment. These comparisons illustrate commonly made mistakes as well as the possibilities presented by each subject.

The book will be particularly useful to beginners, although advanced photographers certainly will benefit from studying the photos.

ASIAN FIELD GUIDES

With the publication of two new books, visitors to Asia at last have English-language field guides that can help to identify the bewildering array of birds found on that vast continent.

A FIELD GUIDE TO BIRDS OF THE USSR by V. E. Flint, R. L. Boehme, Y. V. Kostin, and A. A. Kuznetsov. 1984. Princeton University Press, Princeton, New Jersey. 353 pages. $65.00 (cloth).

B*irds of the USSR* is not completely new, but an updated translation of a Russian work first published in 1968. It describes 728 of the nearly 750 species known to occur in the country, most of which are nicely illustrated on colorplates. Species accounts discuss field marks, habits, distribution and similar-looking species; range maps are also included. The introduction contains a short section on tips for birding in the USSR, a discussion of Soviet natural history, and concise descriptions of the country's five most interesting birding regions. The book also covers much of Europe and India.

THE BIRDS OF CHINA by Rodolphe Meyer de Schauensee. 1984. Smithsonian Institution Press, Washington, D.C. 602 pages. $45.00 (cloth) $29.95 (paper).

B*irds of China* is the first book to describe all 1,195 species of birds found in China. Nearly half the birds are illustrated on beautiful colorplates, and the text contains detailed descriptions of each species with key field marks italicized. Species' ranges and habitats are also discussed. The introduction includes a discussion of the country's major geographic regions—mountains, basins, rivers, and islands—and an interesting historical account which describes important Chinese ornithologists and their expeditions and writings from the 1860s to the 1970s.

SEX DIFFERENCES

Male and female birds of the same species often feed in different ways. Male downy woodpeckers, for example, often forage on small branches while females usually feed on large branches and tree trunks. Many ecologists believe that different foraging methods have evolved to minimize competition for food between the sexes. By hunting in different areas or using different techniques, birds avoid competing for the same prey.

If this is true, an interesting question remains unanswered: are different foraging behaviors determined genetically, that is, are birds born with a specific behavior that never changes? Or is foraging behavior determined by social dominance, where one sex forces the other to use certain techniques or to feed in certain areas?

Wm. David Peters and Thomas C. Grubb, Jr. of Ohio State University have examined this question in three Ohio woodlots where they studied the foraging behavior of downy woodpeckers during two consecutive winters ("An experimental analysis of sex-specific foraging in the downy woodpecker, *Picoides pubescens.*" *Ecology,* vol. 64, pp. 1437–1443).

During the first winter the researchers observed the foraging behavior of both sexes in all three woodlots, and found that males fed primarily on small branches and twigs in the upper tree canopy, while females selected large branches and tree trunks closer to the ground.

During the second winter Peters and Grubb removed all female downy woodpeckers from one woodlot. Result? The males' foraging behavior did not change from that of the previous year. On the second woodlot the researchers removed all the males. Here the results were different: the females began foraging like males, selecting smaller branches and twigs higher in the trees. On the third woodlot the researchers removed no birds, and all continued to feed as they had the previous year.

From these observations Peters and Grubb concluded that the foraging behavior of male and female downy woodpeckers is not genetically determined. Rather, males appear to be dominant over females; under normal conditions males displace females from favored feeding locations. When males are absent females apparently have no trouble altering their behavior and foraging in areas normally reserved for males.

This study adds to a growing body of evidence that suggests that foraging behavior of many bird species is highly adaptable, depending on social or environmental conditions. Just as the feeding behavior of one sex may be affected by the other, so may the behavior of one species be affected by another. Therefore, attempts to determine the "typical" behavior of a given species, as many studies have recently done, may be fruitless.

MORNING SONG

During spring and summer in most parts of the country, morning brings a din of bird song. As the day wears on, though, the birds become quiet. By noon, only a few songs can be heard.

Why do birds sing in the morning? Song is primarily a means of advertising and defending territorial boundaries; one explanation for the dawn chorus is that morning is a particularly good time for birds to ward off intruding neighbors. But why should morning be better than afternoon or evening?

Mark I. Avery and John R. Krebs of the Edward Grey Institute of Field Ornithology, Oxford, England, have a possible answer. They speculate that morning may be the best time for birds to sing because the early hours are too cold for efficient foraging, even though studies have shown that birds wake up hungry.

Most songbirds feed primarily on insects, which become more active as temperatures rise. Therefore, Avery and Krebs reason, birds may defend territories early in the morning while their prey are inactive, and switch to feeding later in the day when warmer temperatures have prey on the move.

But are active insects easier to capture than passive ones? To find out, Avery and Krebs designed an experiment using four great tits, relatives of North American chickadees. The researchers released the tits one at a time into cages of different temperatures. Each cage contained two logs and several live spiders ("Temperature and foraging success of great tits *Parus major* hunting for spiders." *Ibis,* vol. 126, pp. 33–38).

Avery and Krebs observed the birds foraging and discovered that they captured more spiders at higher temperatures, when the spiders were more active, than at colder temperatures, when the prey were motionless or moved very little. The birds are probably better able to see moving spiders than motionless ones, therefore, it seems likely that tit foraging success would be lower in the morning and higher in the afternoon.

Like all animals, birds have evolved behaviors that allow them to use their energy most efficiently. If afternoon is a good time for foraging, then morning may be better for singing and defending territories.

Marsh wren

TIM FITZHARRIS

WASTE DISPOSAL

Nestling songbirds excrete their feces in mucous membranes known as fecal sacs which the parents remove from the nest. Ornithologists have assumed that fecal sacs are produced and removed primarily as an aid to nest sanitation, a reasonable explanation considering that for several weeks songbird nests are home to an immobile clutch of defecating youngsters. However, parent birds often carry the sacs great distances from the nest. If the sacs are merely sanitary aids, why bother carrying them far away?

Patrick Weatherhead of Carleton University, Ontario, Canada, examined this question by studying 23 pairs of tree swallows breeding in nest boxes in eastern Ontario ("Fecal sac removal by tree swallows: the cost of cleanliness." *The Condor,* vol. 86, pp. 187–191). When adult swallows emerged from the boxes, Weatherhead noted whether they were carrying fecal sacs and the direction from the nest in which they flew. If a bird was carrying a sac, he noted the distance from the nest at which it was dropped.

ALBERT KUHNIGK (VALAN PHOTOS)

Tree swallow

Weatherhead discovered that swallows carrying fecal sacs flew in random directions, while those without sacs usually headed for favored foraging areas. Also, most sacs were dropped far from the nest—as much as 75 yards away. This indicated that sacs were being dispersed over a wide area, rather than concentrated in a small one. Weatherhead believes the swallows scatter the sacs in order to deter nest predation. If fecal sacs were allowed to build up in or near the nests, he suggests, then predators could locate nests simply by searching for concentrations of the conspicuous white sacs.

If Weatherhead is correct, it is possible that fecal sac production evolved primarily as a means for songbirds to dispose of telltale evidence of nesting, and that sanitation is only a secondary benefit. This idea is supported by the fact that nestling birds of many species do not produce sacs. These include species which are not highly susceptible to predation, such as certain hole nesters whose feces are hidden from predators, and raptors, whose large, aggressive parents are effective predator deterrents. Many of the hole nesters simply wallow in their excrement, while raptors expel it over the side of the nest.

NEWS & NOTES

Compiled by Steven C. Sibley

AFTER FIVE YEARS of field work and four years of compilation, *The Atlas of Breeding Birds of Vermont* is now available from the Vermont Institute of Natural Science. The atlas contains information gathered by volunteer bird watchers on the distribution of breeding birds throughout the state. Patterned after atlases done in Europe, more than 20 states are currently conducting breeding bird atlas projects. Vermont's is the first state atlas project to be published.

The Atlas of Breeding Birds of Vermont is available for $45 (shipping: $1.50, 25¢ each additional copy) from University Press of New England, 3 Lebanon Street, Hanover, New Hampshire 03755.

SCOTT A. SUTCLIFFE has been selected the Laboratory's new development officer. Scott brings with him a broad background of experience as former director of both the North American Loon Fund and New Hampshire's Loon Preservation Committee, and most recently as executive director of the Long Island chapter of The Nature Conservancy.

THE 17TH Arthur A. Allen Award will be presented to Robert S. Arbib, Jr. and Susan Roney Drennan at a dinner in Ithaca, New York on October 18, 1985. This award is given by the Laboratory of Ornithology in recognition of outstanding contributions to ornithology. Arbib and Drennan are being honored for their efforts in increasing the value of the journal *American Birds* for amateur and professional ornithologists.

Invitations will be mailed in August to Laboratory members living in New England, New York, New Jersey and Pennsylvania. If you live elsewhere and would like to attend, please write Jane Wood at the Laboratory or telephone (607)256-3341.

THE ADMINISTRATIVE board of the Laboratory welcomes seven new members: Albert F. Appleton, Rex J. Bates, David L. Call, John H. Dakin, Frances C. James, Peter R. Marler, and Eugene S. Morton. Eugene Morton is a research zoologist at the Smithsonian Institution's National Zoological Park and an adjunct professor at the University of Maryland, College Park. Peter Marler is a professor at Rockefeller University, New York City. Frances James is professor and curator of birds and mammals at Florida State University in Tallahassee. John Dakin is a financial consultant with Kahn Harris Dakin Inc. in Mill Valley, California. David L. Call is a professor at Cornell University and dean of its College of Agriculture and Life Sciences. Rex Bates is financial vice president of State Farm Insurance Company in Bloomington, Illinois. Albert Appleton is deputy attorney general for the State of New York and an adjunct assistant professor at St. John's University in New York City.

In addition, Edwin H. Morgens, William G. Conway, Alan Crawford, Jr. and Hamilton F. Kean were reappointed to new terms on the board. David L. Call was selected to serve as chairman. All terms began July 1.

The board bade farewell to departing members James W. Spencer, who stepped down as chairman, and Robert G. Engel. Charles E. Treman, Jr., whose term expired in June, has been named the third honorary life member of the board, joining T. Spencer Knight and Olin Sewall Pettingill, Jr.

BIRD BANDING EQUIPMENT, new or used, is needed by a licensed bird bander and teacher at St. Mary's High School in St. Mary's, Alaska. Brian McCaffery is establishing a bird banding and wildlife management curriculum at the school and needs mist nets, banding pliers, pesola scales and other banding items. St. Mary's is situated far out on the Yukon River Delta, an excellent place for banding activities.

Please send donated equipment to Brian McCaffery at: Science Department, St. Mary's High School, St. Mary's, Alaska 99658.

THE SAPSUCKERS, the Laboratory of Ornithology's biggest day birding team, tied the National Geographic Society team for the highest number of bird species found by an out-of-state team, in the second annual New Jersey World Series of Birding held last May. Both teams found 163 species, but the Ed Stearns Award went to the Geographic team because it found its last species one hour earlier than the Sapsuckers. Pouring rains and high winds in northern New Jersey kept all totals depressed, except for the winning in-state team, the Delaware Valley Ornithological Club, whose concentrated efforts in the southern part of the state allowed it to find 182 species and capture the Urner-Stone Cup.

Dear Member:

With this issue, *The Living Bird Quarterly* begins its fourth year of publication. During the first three years we've tried to bring you interesting and exciting articles intended to help you understand and appreciate birds and the environment. We've published travelogues and book reviews as well as stories on bird biology, life history and conservation, bird art and literature, and finding, watching and feeding birds. And always we strive to accompany each article with the finest bird photography.

Has the *Quarterly* been successful? When we published volume 1, number 1 in the summer of 1982, the Laboratory had fewer than 3,000 members. Today the magazine rolls off the presses into the hands of 11,000. We hope that some of these new members have joined the Lab in order to receive the *Quarterly.*

Another measure of success: the *Quarterly* recently won its second award, a gold medal, for "special audience periodicals" from the Council for the Advancement and Support of Education (CASE), Washington, D.C. The judges cited the *Quarterly* as meeting "a particularly high standard of excellence and an example for others to follow."

But is it a success with you, our members and prime audience? Our editors carefully plan each issue to bring you a mix of articles on a wide variety of subjects, and they are constantly searching for new ideas. For example, beginning with next winter's issue, we'll be presenting a series of articles on bird behavior by Donald and Lillian Stokes, authors of the excellent *Guides to Bird Behavior.* We are also trying to increase coverage of important environmental topics that affect the well-being of populations of wild birds.

As we plan future issues of the *Quarterly,* we invite all of you to share your ideas about the magazine. What articles have you enjoyed? What would you like to see more of? Less of? Are there any authors you've found especially informative or entertaining? Let us know what you think, and together we can make the *Quarterly* the best possible bird magazine.

***Charles Walcott,* Executive Director**

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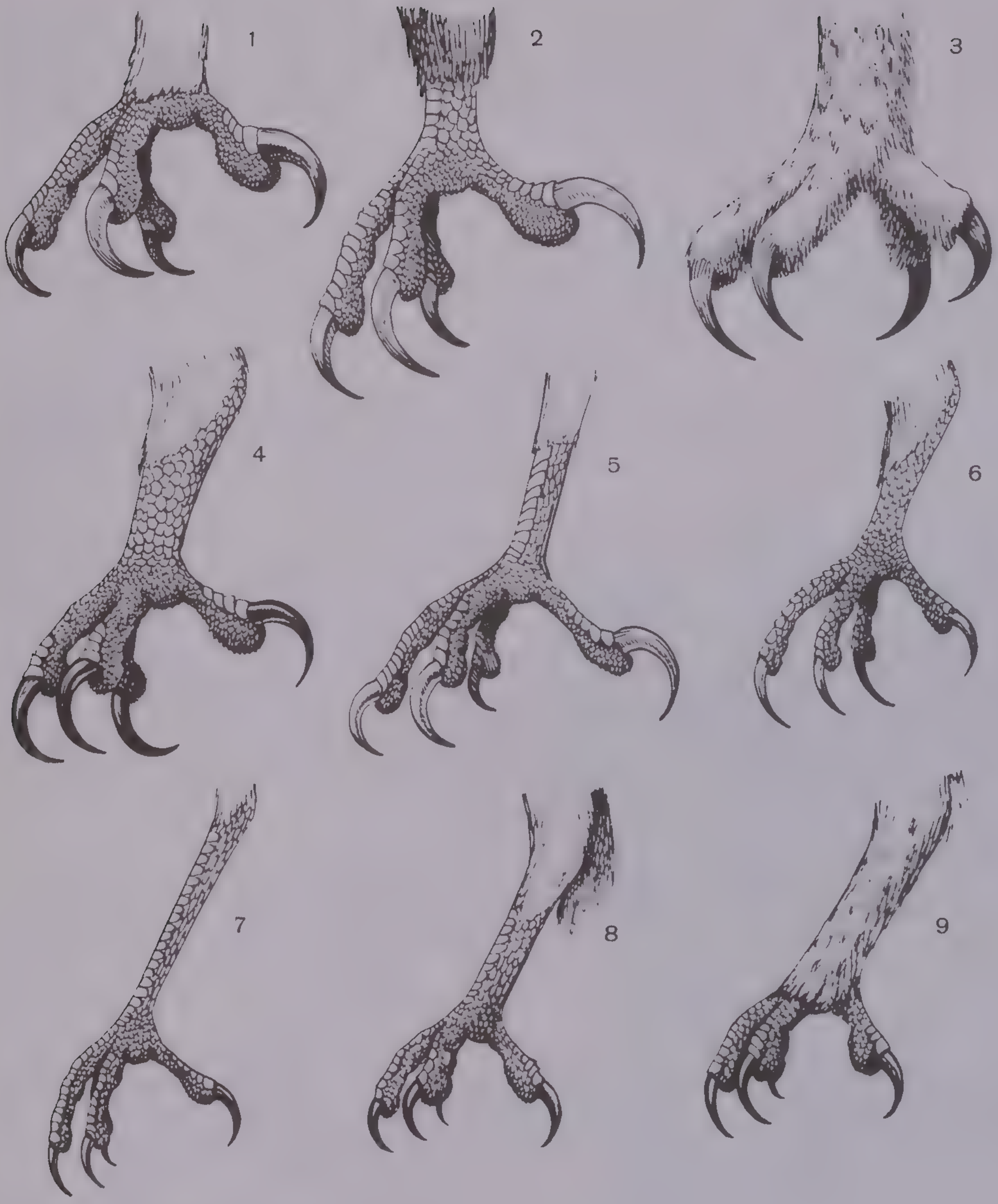

From *A Field Guide to Birds of the USSR*

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Go beyond identification and explore a new way of looking at birds: behavior watching. These guides are for enthusiastic nature lovers who are curious about the habits of birds. Each guide covers 25 common species, and allows the reader to experience the whole life of the bird—from nesting to adulthood. Illustrations.

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A Field Guide to Birds of the USSR

V. E. Flint, R. L. Boehme, Y. V. Kostin, A. A. Kuznetsov

Beautiful volume with 48 colorplates, 71 line drawings and 303 maps describing 728 species covering the USSR and much of Europe, East and Central Asia, and India. Also included are species identification, ranges, and translator's advice to traveling bird watchers.

1984, cloth, 353 pages.
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The Birds of China

R. M. de Schauensee

Comprehensive volume covers 1,195 species of birds belonging to 88 families with emphasis on diagnosis of field characteristics. Following each description is the bird's range throughout China, with notes on outside ranges, ecology, and taxonomy. Seventy-seven colorplates show many of the species. Extensive history of ornithology in China and a section on the geography and physical features are included. Maps and checklist.

1984, paper, 602 pages.
No. 2331/$29.95/$26.96 members

Lesson III

Geo. B. Wolfe III, a student in the Laboratory's correspondence course in bird photography, assesses his progress as part of the assignment in Lesson III.

My bird photography to this point: my best, and I'm being generous, is extremely average. The bird photos I see published in magazines and books are extremely sharp; few, if any, of mine reach this degree of crispness. Also the published photos show some degree of behavior. I seldom seem to catch that moment.

I don't believe I have any glaring (therefore easily correctable) technical weakness, rather it seems to be the culmination of several factors that I'm not doing well.

I should be experienced enough in photography (if not bird photography) to get what I want, but I can't. For one thing, the birds won't hold still and seem to come closest when the light is worst. I've come to the conclusion that either Mother Nature doesn't love wildlife photographers, or camera, film, and lens manufacturers are in cahoots to drive us crazy.

If the sun were just two or three times as bright, or if animals moved around during the middle of a bright day, or weren't so bashful about having their photos taken, everything would be so much easier.

And why can't they make an ASA 16,000 film that is grainless? Or a 400mm lens that can take a picture after sundown? And who invented the rule that says close-ups have so little depth of field? Got to be a conspiracy!

Getting close to birds: I get birds within my minimum focusing distance at my feeder; however, they usually look like what they are—common birds at a feeder. Stalking is useless if the goal is to fill the frame with the image of a bird.

Show me a man who can stalk within 30 feet of a turkey or red-tailed hawk and I'll show you a ghost. Using a blind in the proper position must be the answer. I'm going to try to do better in this area.

Knowledge of birds: There are thousands of books written on the subject of what I don't know about birds. Even with a guide in hand, I can't identify some of the birds I see. I took a dozen pictures of a great crested flycatcher and thought it was some kind of warbler! What more can I say about my ignorance? If, through a miracle, you can help me learn enough to sell some bird photos, I promise that the first payment will go toward my enrollment in the Laboratory's bird biology course.

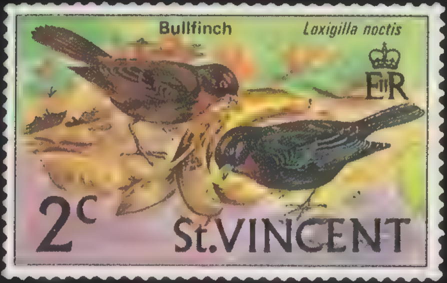
Improving my weak points:

#1. I'm going to buy a steady tripod; the one I now have shakes when the dog snores. I don't care what it weighs, but I would like one which will help me take eye-level shots without my having to give up breathing for three minutes.

#2. I'm going to get another flash unit and *use* it. The rechargeable batteries on my old flash died awhile back and the replacement cost made me act mulish. Maybe then I won't have to wait for the birds to hold still and pose.

#3. Sooner or later (more likely the latter) I'm going to buy a lens I can be proud of. I'm going to be the world's best nature photographer if I just win the *Reader's Digest* Sweepstakes!

Yes, I know I can't buy my way into becoming a great photographer but, if I can't blame my equipment, I must blame the person behind the equipment. And that's me.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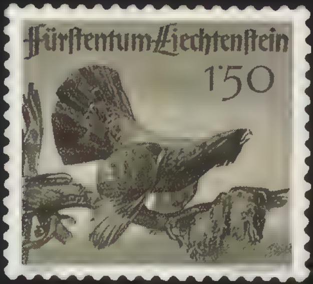
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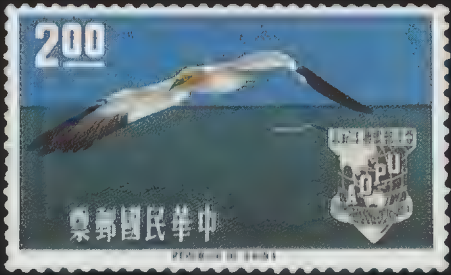
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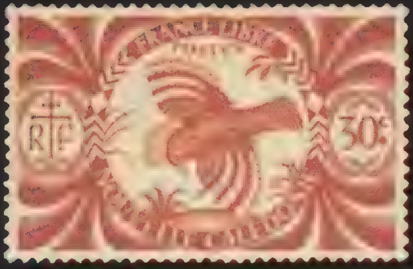
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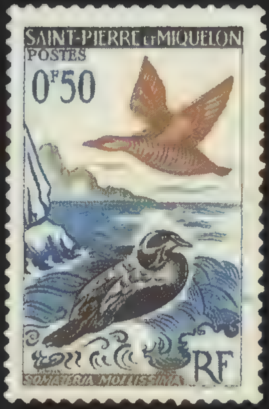
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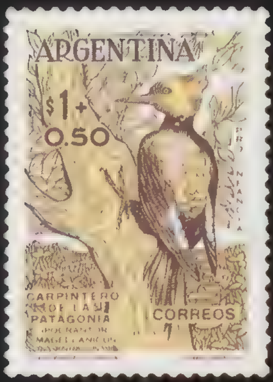
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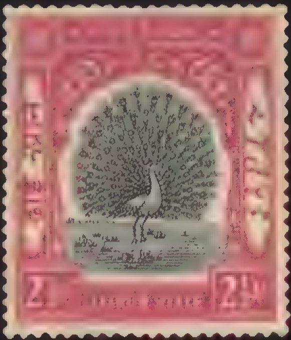
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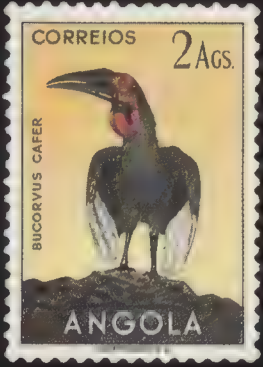
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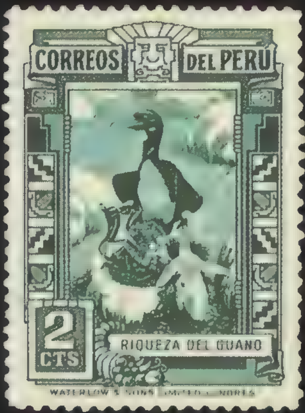
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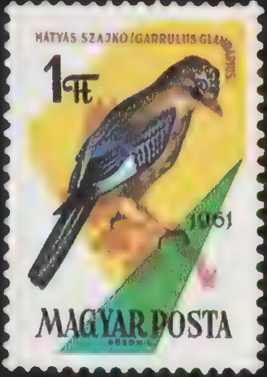
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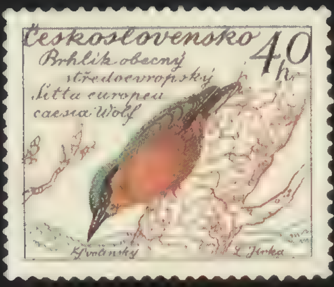
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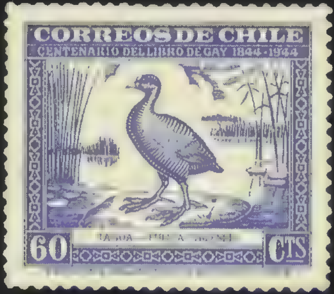
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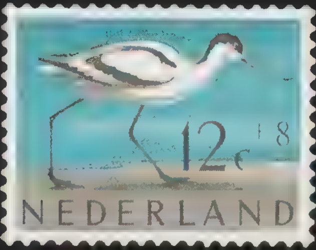
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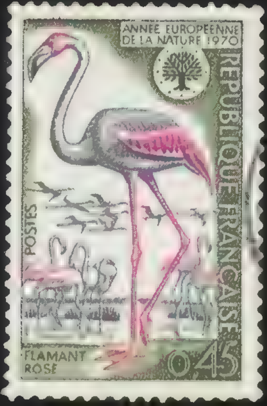
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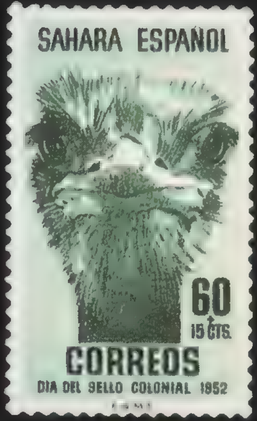
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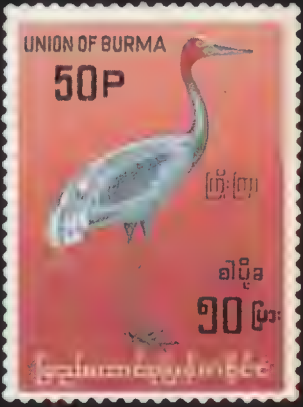
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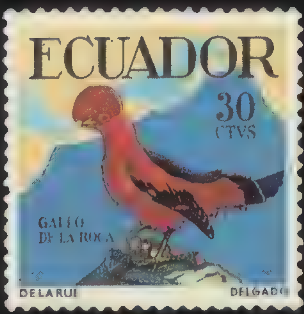
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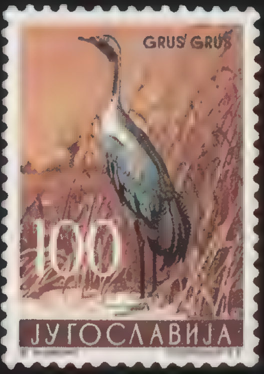
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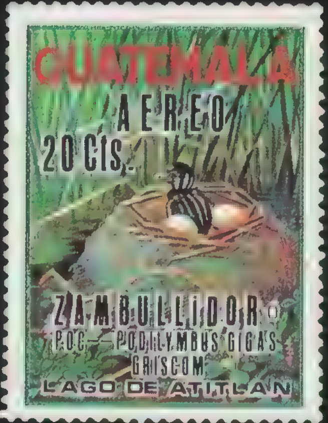
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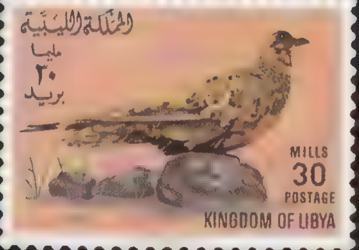
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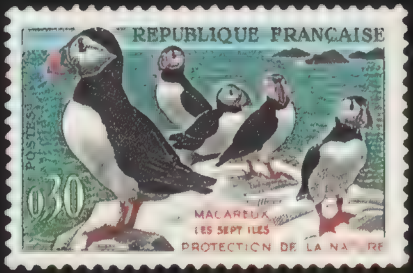
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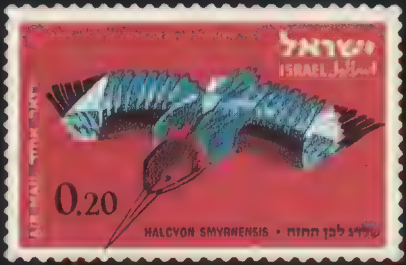
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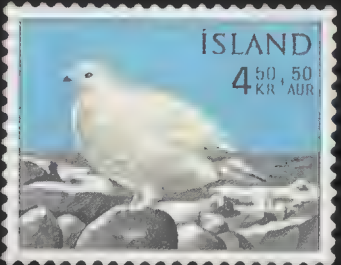
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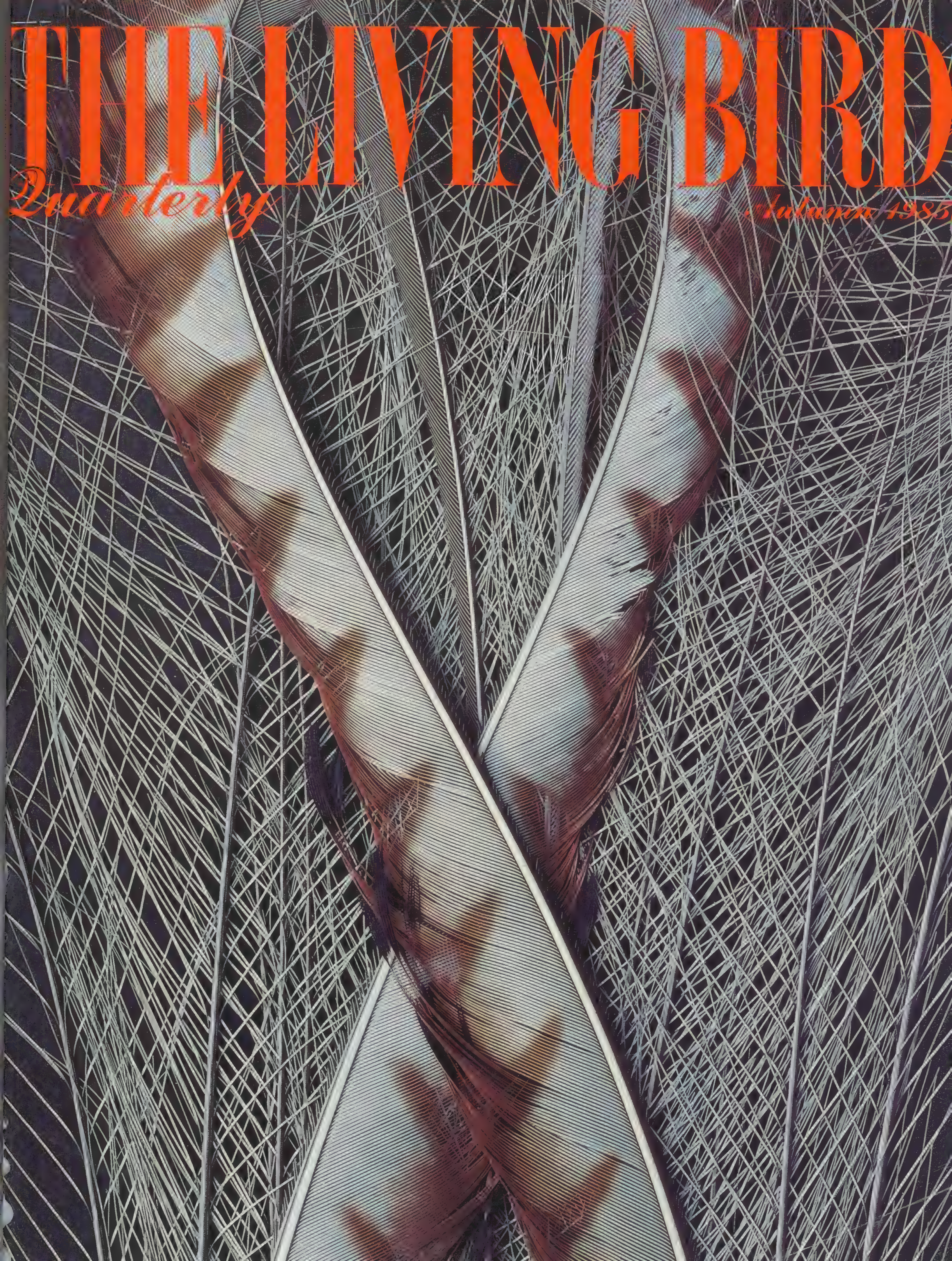
THE LIVING BIRD

Quarterly

Autumn 1985



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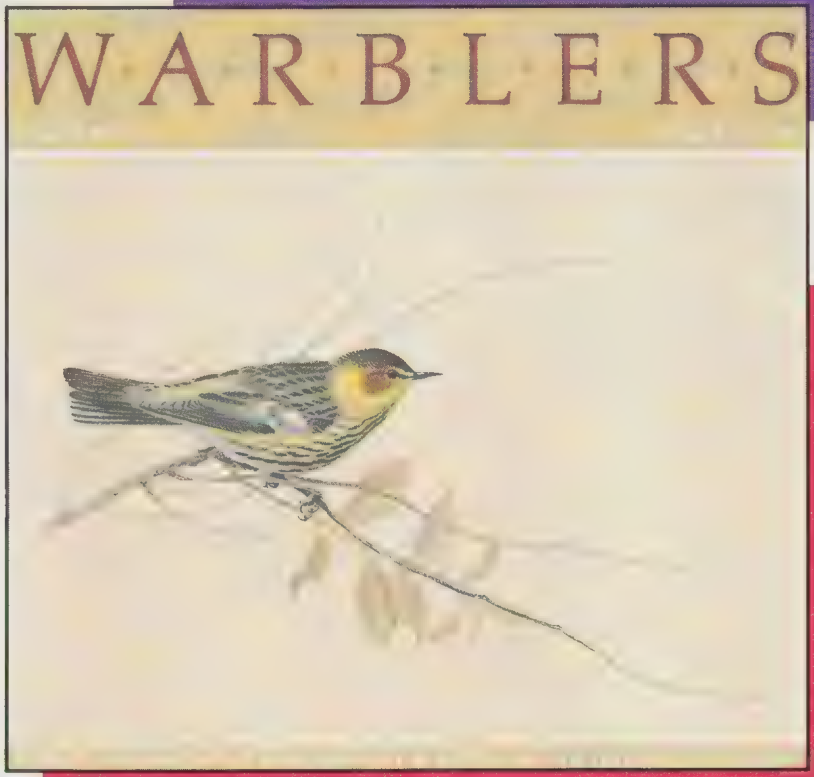

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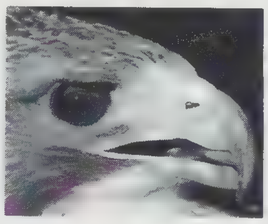
Front Cover. Tail feathers of a superb lyrebird of Australia. **Back Cover.** Wing feathers of a nicobar pigeon of the Solomon Islands. Photographs by D. Cavagnaro/DRK Photo. Feathers, unique to birds, are functional as well as beautiful. They provide insulation and protection from rain, snow and sunlight, and are often used in courtship. The male lyrebird spreads his elegant tail over his back and head during elaborate courtship dances.

p. 4

4 **Whither Two Warblers?**
Frank B. Gill

Golden-winged warblers are disappearing as a breeding species from the northeastern United States. What are the reasons behind the waning of the species? What role is played by its close relative, the blue-winged warbler?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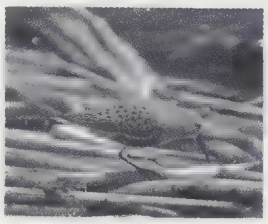
8 **A Propensity to Mob**
Douglas H. Shedd

Among other "altruistic" behaviors, birds will attack potential predators and try to drive them away. Are mobbing birds endangering their lives or increasing the chance of survival for themselves and their young?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Long legs, short legs, long bills, short bills, picking, probing and turning stones. Migrating shorebirds feeding on the same narrow band of beach compensate for their similarities with some striking differences.

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WHITHER TWO WARBLERS?

FRANK B. GILL

Decisions to split or lump species are not made by a committee of elite ornithologists determined to confuse bird watchers.

What is a species? At first the answer seems as simple as a textbook definition: a group of physically similar and intimately related plants or animals that does not breed with any other group to produce fertile offspring. While various species may compete for food or space, they are generally different enough in their ecology or behavior so that rarely does one force another to the point of extinction.

Most species readily fit this definition—cardinals look like other cardinals, mate only with cardinals to produce more cardinals. They may compete with other birds that inhabit woodland edges, but usually do not cause competing populations to decline seriously. The same is true for most species, be they mountain lions, spring peepers or hemlock trees.

All birds do not neatly conform to the concept of species. Consider the northern oriole: it was classified as two separate species, the Baltimore oriole and Bullock's oriole, until 1973 when ornithologists decided to lump them together because the two interbreed extensively in the midwestern United States where their ranges meet. What about the alder flycatcher and the willow flycatcher? These two species look so similar that the only reliable way to distinguish them is by their slightly different songs. They were considered a single species—Traill's flycatcher—until 1973 when ornithologists split them into two separate species because they did not seem to interbreed.

Decisions to split one species into two or lump two into one are not made arbitrarily by a committee of elite ornithologists determined to confuse bird watchers. When assigning birds to species, scientists examine many factors including size and color, song, courtship and nesting behavior, habitat, and whether the birds interbreed with other species. The judgments that result from these examinations attempt to reflect the realities of speciation—the evolutionary process by which species are formed. But the difficulty of the task is compounded by the fact that species are not fixed or static. With the passing of time and the changing of environmental conditions, species may expand or contract their ranges, interbreed and merge with other species, or become extinct.

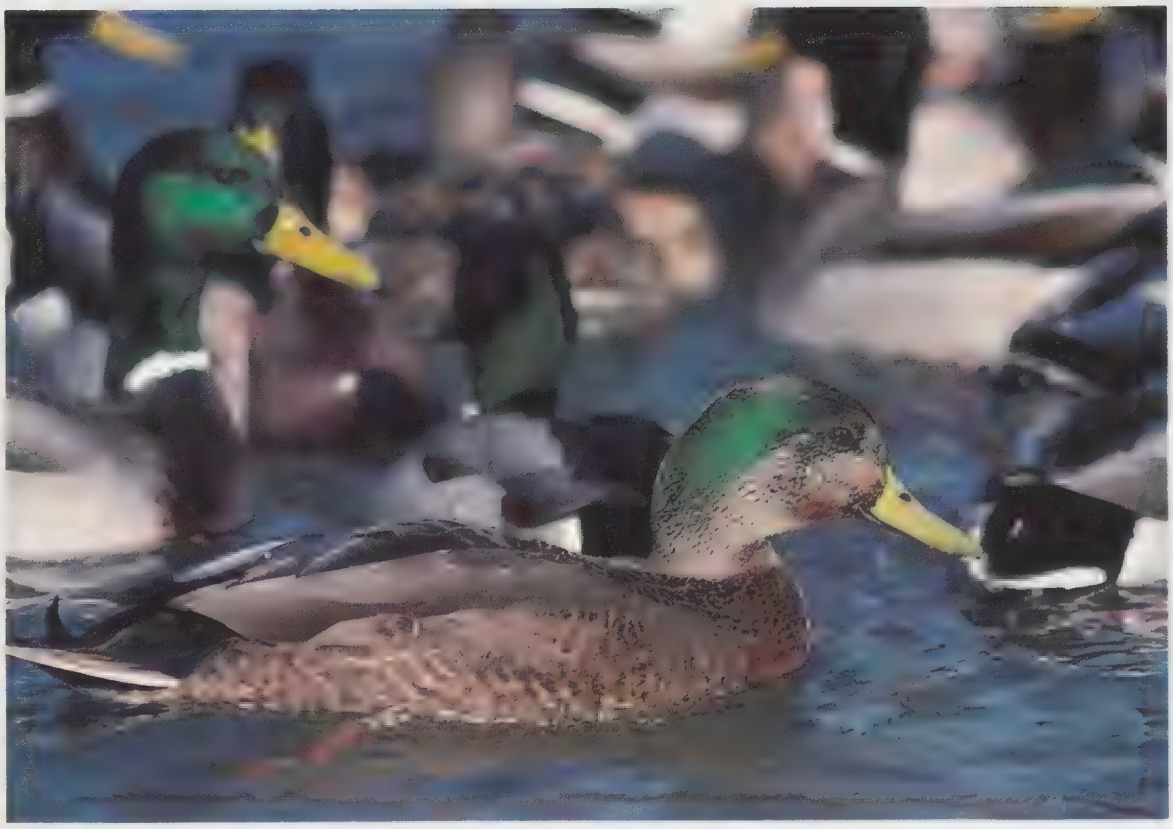
Furthering the understanding of speciation has always been a high priority in ornithology. Rarely, however, have we been in the right place at the right time to monitor carefully over a long period of time the interactions between two species, testing their compatibility and potential for coexistence as distinct entities. One opportunity is before us now; ornithologists are witnessing a confrontation between two closely related species, the blue-winged warbler and the golden-winged warbler.

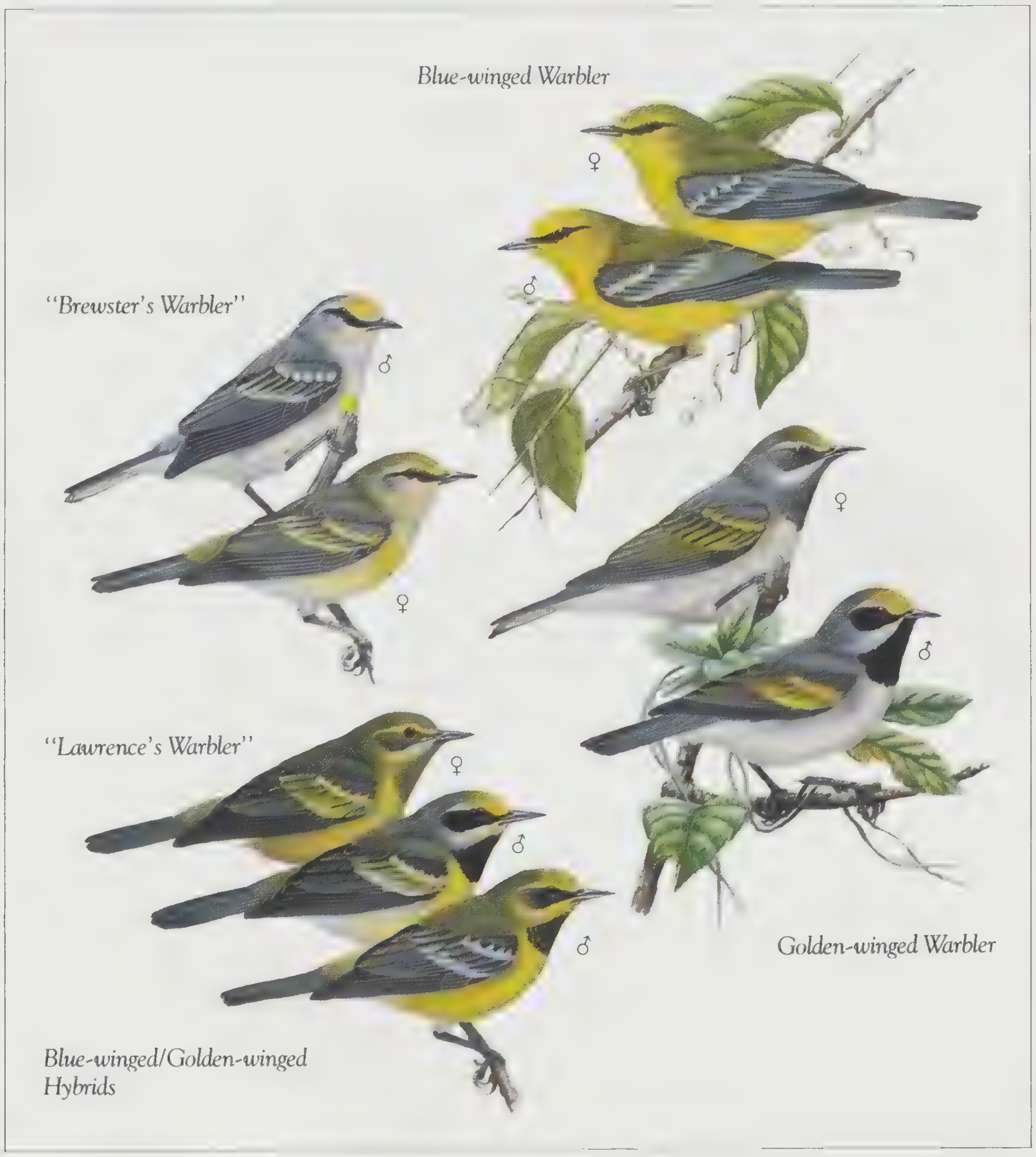
While there are many similarities in their appearance, blue-wings and golden-wings are readily distinguishable, the most telling feature being the colors of their feathers. Blue-wings breed from central Iowa, southern Minnesota and Wisconsin, southern Ontario and central New England south through east-central and Atlantic coast states to South Carolina. They winter from Mexico to Panama. Golden-wings breed further north—from Minnesota

All birds do not conform neatly to the concept of species. The red-shafted flicker (below) and yellow-shafted flicker (left) were once considered separate species. They were lumped into one species, the northern flicker, because they often interbreed where their ranges meet.

HELEN WILLIAMS (PHOTO RESEARCHERS, INC.)

JOHN GERLACH/DRK PHOTO





How many species are shown in this picture? At present only the blue-winged and golden-winged warblers are considered true species; the Brewster's and Lawrence's are classified as hybrids—the young formed by the mating of two separate species. Hybrids are also quite common among waterfowl. The duck above is a cross between a mallard and a black duck, while the one on the facing page is a mallard-pintail hybrid. Plate by H. Douglas Pratt, reprinted with permission, from National Geographic Society Field Guide to the Birds of North America.

and New Hampshire south to Illinois and New Jersey, and in the mountains to Georgia; they winter from southern Mexico to northern South America. Both species prefer to nest in abandoned agricultural fields and pastures, so it is not unusual for them to spend the breeding season in the same place.

What is unusual is that, although the two have long been considered separate species, they possess one characteristic which seems to violate the textbook definition of a species—sometimes they interbreed and produce fertile offspring. In addition, one species, the blue-wing, is replacing the golden-wing wherever the species' ranges overlap. In fact, the two are in conflict along the boundary of their ranges, from Maine to Minnesota.

Fertile offspring. Interbreeding blue-winged and golden-winged warblers can produce a variety of young; the two most familiar of these are called Brewster's warbler and Lawrence's warbler. Typically, the Brewster's is like the blue-wing with whitish underparts. Some have white wing bars, others yellow; some are tinged with yellow below. They may sing like either parent. Lawrence's is the rarer form, with yellow below like the blue-wing, but with the black head pattern of the golden-wing. Lawrence's too may sing like either parent.

At present the checklist committee of the American Ornithologists' Union, the official body which determines classifications for North American birds, considers the blue-wing and golden-wing to be separate species. Brewster's and Lawrence's are known to be hybrids—the young that result from the mating of two separate species. However, the status of these hybrids was debated for nearly 40 years beginning in 1874, when William Brewster described and named the first Brewster's warbler, and Herold Herrick described the first Lawrence's. Through the years the warblers were postulated to be: distinct species that interbred occasionally with blue-wings and golden-wings; color phases—Brewster's a white phase of the blue-wing, and Lawrence's a yellow phase of the golden-wing, and age variations—Brewster's possibly a first-year plumage of the golden-wing.

In 1913 Walter Faxon of Lexington, Massachussetts finally demonstrated that the birds were hybrids, through careful observation of mixed pairings and their offspring, and application of Mendel's law of heredity, whose principles have proved to be conclusive. Faxon's findings were confirmed and extended 10 years later by T. Donald Carter of the American Museum of Natural History. Then in 1951, Kenneth Parkes of Cornell University wrote the definitive paper on the genetic control of plumage characteristics in blue-winged and golden-winged warblers and their hybrids.

Now, over a century since the hybrids were discovered, blue-winged and golden-winged warblers rank as one of the most intensively studied pairs of hybridizing bird species in North America. In the 1960s and 70s Millicent and Robert Ficken, Wesley Lanyon, Bert Murray and I undertook extensive field studies of color-marked blue-winged and golden-winged warblers and their hybrids. We found that the hybrids may have a slightly harder time obtaining mates than do the pure blue-wings and golden-wings, but the hybrids are fully fertile and do not appear to be at a serious disadvantage. The low frequency of hybridization (5 to 10 percent) is not so great as to threaten the integrity of either species, and thus lumping the two species does not seem warranted.

Blue-wing replacement. Our interest in the hybrids, however, drew our attention away from the real action. Recently we realized that blue-winged warblers are extending their range in the northeastern United States, and replacing golden-wings wherever they come into contact. In the late 1950s, for example, blue-wings spread up the Kanawha River from the Ohio River valley to Charleston, West Virginia. Charleston birder Ann Shreve monitored the disappearance of golden-wings and the increase in relative abundance of blue-wings from 5 percent in 1960 to 100 percent in 1978.

Pioneering blue-wings are now nesting in northern Minnesota, Wisconsin, Michigan, and New York State, and their numbers are rapidly increasing. For example, blue-wings reached Ithaca, New York around 1947 and made up 60 percent of the blue-wing-golden-wing population by 1958. In 1981, a census by John Confer and Kristine Knapp of Ithaca College indicated an increase to 84 percent. Further south, the process is proceeding inexorably. In southern Connecticut, where golden-wings were once seen routinely by bird watchers, they have disappeared as a breeding species. If the current trend continues, the golden-winged warbler may be replaced by the blue-winged in less than 100 years.

TOM MANGELSEN

Why is this replacement happening? We do not have enough information to answer this question decisively, nor do we understand all the reasons for the golden-wing's decline. However, when two closely related species are found in the same area they may compete for food and nesting space. If the competition is especially fierce, one species may replace another or cause it to decline in number.

Both species of warbler nest on the edges of old fields or in small clearings, but the Confer-Knapp study of the ecology of the species near Ithaca indicated that the golden-wing uses only fields with a few shrubs or small trees, whereas the blue-wing uses a broader range of habitats, including those preferred by golden-wings. This means that golden-wing habitat depends on a continuous abandonment of cultivated land which may develop into old fields and shrublands, while blue-wings can use fields for a longer period of time—until they have become densely overgrown with large trees. Since few fields are now being cleared for farming and many old fields are growing into forests through much of the species' ranges, golden-wings may be disappearing as a result of the changing ways in which humans use the land. And hybridization doubtless siphons off some fraction of the pure golden-wing population each year.

Regardless of the answers, the future of the golden-winged warbler remains in question. Only if blue-wings prove unable to nest successfully at the northern fringes of the golden-wing's range or at high elevations in the Appalachians, or if golden-wings achieve some ecological advantage, and refuse to take blue-wings or hybrids as mates, will golden-wings have a chance of surviving.

How will it end? Will the golden-wing become extinct? Will it become an even rarer species existing only on the fringes of the blue-wing's range? Will it be absorbed into blue-wing populations so that the two species become one? Or can it hold its own or even gain the upper hand?

What we need are long-term studies on the frontiers of the birds' ranges. The pace and pattern of disappearance of golden-wings, the frequency of hybridization, and the changes in genetic composition of successful blue-wing populations should be documented throughout the northeast.

Birders can help to monitor the situation by recording data about the birds wherever they are seen nesting or on their wintering grounds in Central and South America. A rare opportunity to watch the evolution of a species is before us, and one in which both amateurs and professionals can participate.

Frank Gill is curator of ornithology at the Academy of Natural Sciences, Philadelphia, Pennsylvania.

Further Reading

Pasquier, Roger F. *Watching Birds: An Introduction to Ornithology.* Houghton Mifflin Company, Boston. 1977.

A PROPENSITY TO MOB

DOUGLAS H. SHEDD

Why should an animal approach a potential predator and make itself as conspicuous as possible?

A black-capped chickadee foraging among the trees is startled by a roosting screech-owl. Instead of fleeing from the owl, it produces a call-to-arms, the familiar "chick-a-dee-dee-dee." It moves closer to the owl while flicking its wings and tail, and continues to call loudly. Within minutes 20 other birds of several species have joined the chickadee and are darting around the owl. If it does not try to escape, its tormentors gradually will lose interest and return to their other activities. If the owl flies away, it will be closely pursued.

The behavior stimulated by the screech-owl in this aggregation of birds is called mobbing. This episode illustrates a common form of mobbing, where a predator is approached and harassed by its potential prey.

The list of birds that mob predators is a long one. In my 10 years of studying the subject, I have recorded mobbing by 60 species of songbirds, five species of woodpeckers, two species of hawks, and one species of hummingbird. Mobbing is also a common response to predators among gulls, terns, and other seabirds that nest in colonies.

Despite the apparent danger, a blacksmith plover besieges an eagle in Kenya. The great horned owl, right, another efficient predator, is also commonly assaulted by smaller birds.

J. C. CARTON (BRUCE COLEMAN INC.)

Mobbing is not confined to birds. It also has been observed among mammals: axis deer and baboons mob leopards, and ground squirrels mob snakes. That mobbing is so widespread, despite the fact that it requires a good deal of energy, suggests it must have an important function. What this function is, however, has long been a mystery to scientists. Why should an animal approach a potential predator and make itself as conspicuous as possible? It would seem that mobbing a predator would be much more dangerous than fleeing. Why do so many animals take the risk?

The questions raised by mobbing are part of a larger issue concerning the function and evolution of "altruistic" or "self-sacrificing" behavior in animals. In behaviors such as mobbing, an animal places itself in jeopardy; others may benefit from its actions, but what about the animal performing the behavior?

The concept of natural selection predicts that behaviors should evolve in order to increase the likelihood of an individual's survival and reproduction. At first glance, however, it is difficult to explain mobbing in this way. If mobbing is as risky as it seems, how could it have evolved by natural selection? Wouldn't animals with a tendency to mob be killed or injured while nonmobbers that flee or avoid a predator survive and reproduce? Do behaviors such as mobbing challenge natural selection as the driving force behind evolution?

There has been much research recently on mobbing and several possible functions have emerged, all consistent

Do behaviors such as mobbing challenge natural selection as the driving force behind evolution?

with an interpretation based on natural selection. Much of this research has been summarized by Eberhard Curio of Ruhr University in West Germany, who has been studying avian mobbing behavior in Europe for over two decades. Based on his work and that of others, he has developed various hypotheses to explain mobbing. They include: to defend a nest, to serve as a distraction display, or to drive predators away (the "move on" hypothesis). Each hypothesis attempts to explain how the benefits of mobbing outweigh the apparent risks.

Although these hypotheses are difficult to sort out and study in the field, I attempted to test one, namely, that mobbing serves as a form of nest defense. As my starting point I relied on research that showed that mobbing was most common and intense during the breeding season—suggesting that it might be most worthwhile for a bird to mob when the activity would benefit the young. The increase in the frequency and intensity of mobbing during spring and summer had been reported as long ago as 1890 and was documented further in 1956 by Stuart Altmann of the University of Chicago.

In my research I used a stuffed eastern screech-owl to stimulate mobbing. I chose this species because it is often vigorously mobbed by small birds, and no wonder. During the breeding season over 60 percent of the animals caught by a screech-owl may be birds. I soon realized, though, that using the stuffed owl alone doomed me to hours of waiting for it to be discovered and mobbed. To overcome this problem I added a taped screech-owl call, and together the two nearly always produced a rapid mobbing response.

Several months of gathering data in the Ithaca, New York area confirmed that many kinds of birds displayed seasonal variations in mobbing intensity. This was especially evident in species that were summer residents of my study area. These birds stopped mobbing entirely at the close of the breeding season. Permanent residents displayed a somewhat different pattern: they showed an increase in mobbing during the breeding season, but continued to mob at a reduced rate after the breeding season was over. It appeared that for all species the occurrence of mobbing peaked when the young were present, but being a permanent resident also contributed to a propensity to mob.

Eventually I narrowed my work to two representative species—the American robin, a summer resident, and the black-capped chickadee, a permanent resident. I chose these two chiefly because of their abundance in my study area. My findings with the two species reinforced my preliminary results. Mobbing by chickadees showed peak intensity during the breeding season, but the birds continued to mob during the fall and winter. They mobbed even on one snowy January day when the temperature was 25 degrees below zero, a time when it is hard to imagine mobbing as an advantage, considering the additional energy it requires. The migratory robins mobbed only during the breeding season. In the fall they gathered into large seminomadic flocks, and occasionally approached the mounted owl, but did not mob. Tests on wintering robins in Florida produced similar results.

These findings seem to support one of the theories behind the function of mobbing, if not in all species, at least in robins and chickadees. First proposed by Curio, it is called the "move on" hypothesis, and maintains that mobbing evolved to force a predator from an area where it is hunting. This would be important to chickadees because they live continuously on the same home range; they would mob to protect the young during the breeding season, but they also would want a predator to move on at other times since they cannot relocate to avoid it. In the less sedentary robin, mobbing after the young have fledged would not be worthwhile because the robins could easily move away from the owl.

If mobbing really benefits the mobber or its close relatives, then it probably evolved through the familiar pattern of natural selection. The sacrifice in mobbing may be more apparent than real since birds that mob leave behind more offspring and are more likely to survive themselves as a result of causing predators to "move on."

New elements of mobbing behavior are being discovered all the time. In 1978 Curio and his associates Ulrich Ernst and Willy Vieth at Ruhr University demonstrated that inexperienced birds can learn to recognize a predator by watching the mobbing activities of an experienced bird. This remarkable finding indicates that learning may play a much greater role in predator recognition and mobbing than previously had been realized.

We are still years away from a comprehensive understanding of mobbing. It seems certain, however, that it will prove to have an important function. In addition, studies of mobbing will continue to shed light on the evolution and function of other "self-sacrificing" behaviors in animals.

CHRISTOPHER CROWLEY

JEN & DES BARTLETT (BRUCE COLEMAN INC.)

Mobbing occurs all over the world. In North America, the red-tailed hawk is a frequent victim of attack; in Australia (far right) a willie wagtail harasses a laughing kookaburra.

Douglas Shedd is an associate professor of biology at Randolph-Macon Woman's College, Lynchburg, Virginia.

Further Reading

Wilson, Edward O. *Sociobiology: The New Synthesis.* Belknap Press of Harvard University Press, Cambridge, Massachusetts. 1975.

SHARING THE SHORE

WADE WANDER

FRANS LANTING

Right, red knots, short-billed dowitchers and sanderlings search for food in a mudflat pool. Above, a ragged line of holes marks the passage of a sanderling hunting for food buried in a sandy beach.

HARRY N. DARROW

North American shorebirds spend much of their lives on lengthy migrations. During fall and spring, hundreds of thousands of shorebirds of 25 or more species gather in feeding areas along traditional routes. Here, enormous numbers of birds must confine their feeding to narrow stretches of tidal wetlands.

Unlike a forest, where birds can find food at various levels from the ground to the treetops, all the food in wetland habitats is present at ground level or just below the surface. How can such a simple environment support so many different kinds of birds?

Tidal wetlands are actually highly complex and encompass a wide variety of habitats. Each supports a community of invertebrates upon which particular species of shorebirds feed. Thus, pectoral sandpipers forage mainly among saltmarsh grass, semipalmated sandpipers on mudflats, and stilt sandpipers in brackish pools.

Within each of these habitats, shorebirds further subdivide the feeding area. As the tide begins to recede, birds arrive along the water's edge. At first they must feed together, but as the tide ebbs and more subhabitats are exposed, the various species gradually move to their preferred areas. An expanse of mudflat at low tide might have short-billed dowitchers and greater yellowlegs feeding in shallow water, dunlins and red knots foraging on wet bare mud, and least sandpipers on algae-covered mud.

When species share the same feeding area they usually display differences in feeding behavior. Although they often feed side by side, dowitchers and yellowlegs seek their prey in markedly different ways. Dowitchers probe into the mud vertically with their long, straight bills in an action like that of a sewing machine needle, whereas yellowlegs pick organisms off the water surface and swing their bills from side to side under water in search of small fish.

Along sandy beaches, sanderlings forage in "typical" sandpiper fashion by pecking and shallow probing, while ruddy turnstones use their bills to flip stones and other objects in their hunt for prey, methodically working the debris deposited along the high-tide line.

Such finely tuned ecological differences are reflected in the tremendous diversity of bill and leg lengths that has evolved among shorebird species. Bills vary from the 9-inch sickle with which the long-billed curlew probes deeply for large worms and crayfish, to the half-inch stub of the semipalmated plover, which picks up small prey from the ground. With barely a couple of inches of leg to stand on, the least sandpiper can scamper about only on the mudflats, whereas the aptly named black-necked stilt may easily venture into deep water on its 10-inch legs.

Shorebird species also share habitats through differences in the timing of their migrations. Although migration schedules overlap—on an early September day a single stopover point on the east coast may harbor 25 or more species—peaks of abundance of the various species are short and seldom coincide. In western North America, semipalmated and least sandpipers, nearly identical in form, feeding habitat and behavior, migrate at different times. On the east coast the semipalmated sandpiper migrates at the same time as the least sandpiper, but the two frequent different habitats.

While the various species may occupy different habitats, feed differently, or migrate at different times, shorebirds still face competition from members of their own species. The critical period is during fall migration, when both adults and the young of that year must occupy the same habitat. In most species, however, adults move south well before the young. In fact, females often leave their nesting grounds before the eggs hatch. The males take over parental duties, but depart while the young are still learning to fly. By leaving early, the adults arrive at migration stopovers when food is at peak abundance. The young, physically unable to migrate until several weeks later, are thus one step behind the adults throughout the migration.

The exhilarating panorama of shorebird migration is more than a mere parade of species. Shorebirds' varied forms and fascinating patterns of activity along the narrow tidal bands, illustrate a dynamic biological drama vital to the survival of the dozens of species involved.

On the following pages, a small part of the parade.

Wade Wander is an environmental consultant, co-editor of *North American Bird Bander,* and a research associate of the New Jersey Audubon Society.

Further Reading

Matthiessen, P. *The Wind Birds.* The Viking Press, New York. 1973.

Stout, G. D., ed. *The Shorebirds of North America.* The Viking Press, New York. 1967.

TIM FITZHARRIS

PHYLLIS GREENBERG

HARRY N. DARROW

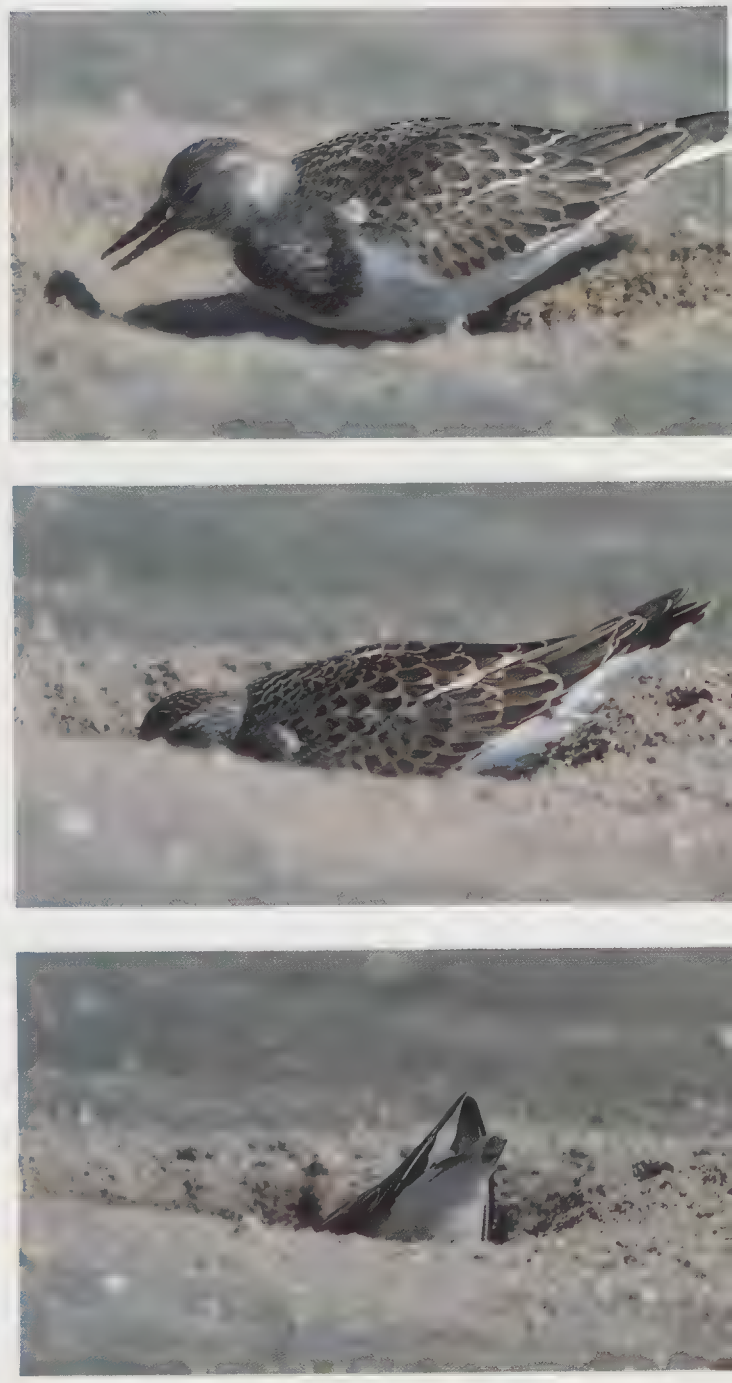
The simple-appearing tidal wetland is actually highly complex and encompasses a wide variety of habitats, which are exploited by different types of shorebirds. Black-bellied plovers (above, top) forage mainly on sandy beaches or mudflats. Long-billed dowitchers (left) and stilt sandpipers (above, bottom) usually feed in water, sometimes wading up to their bellies. However, the dowitcher's longer bill enables it to probe deeper into the bottom, allowing the bird to reach food not available to the shorter-billed stilt sandpiper.

PHYLLIS GREENBERG (2)

Besides feeding in different subhabitats, migrating shorebirds may avoid competition for food by using a variety of foraging techniques. Greater yellowlegs (right) tend to feed in shallow water where they pick and snatch at aquatic insects and small fish. Dunlins (above, top) forage more deliberately, usually probing their way along mudflats in search of insects, mollusks and crustaceans. Sanderlings (above, bottom) frequently feed at the water's edge, chasing waves to and fro and probing vigorously into the sand in search of minute crustaceans such as shrimp.

TIM FITZHARRIS

MARK WILSON (3)



American oystercatchers (left) and ruddy turnstones (above) are among the more unusual North American shorebirds. The oystercatcher's long, knifelike bill enables the bird to pry shellfish from rocks and other objects, while the chisel tip of the bill is used to open shellfish by cutting the muscles that hold the shells together. Ruddy turnstones use their bills to flip stones and other objects, methodically working the debris deposited along the high-tide line. Sometimes turnstones dig deep into the sand in their search for food.

BHL

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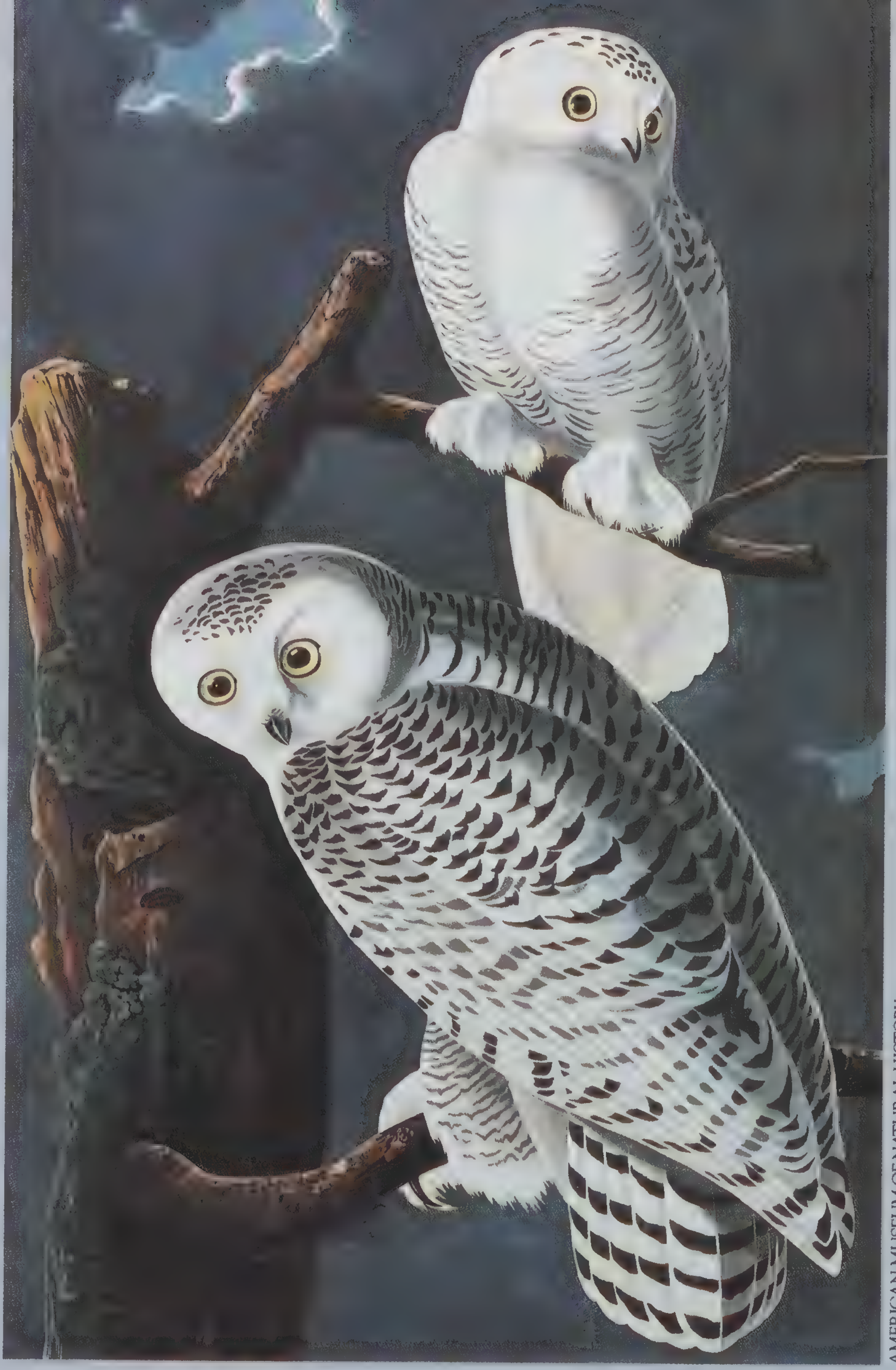

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Window Pains

DANIEL KLEM, JR.

Windows can hold fatal consequences for birds. Unaware of their presence, an estimated 80-million birds crash into these surfaces each year. Not all of a bird's encounters with windows lead to injury or death. During spring and summer, male birds sometimes thrash against reflective surfaces as they attempt to defend their territories against their mirror image. These attacks are usually harmless. However, you may have had the unhappy experience of finding a dead bird lying beneath a window. While eliminating window-strike casualties may not be possible at every location, a few precautions can reduce the number of victims.

Move attractants. Feeders, bird baths, and berry-producing shrubs often bring birds near windows. While this is enjoyable to the viewer, these attractants can be deathtraps for birds. A simple method for preventing collisions may be to move attractants to a new location, out of harm's way. Another alternative is to place them very close to windows. Feeding birds may fly into windows after being frightened by real or imagined danger. If attractants are within a foot of the surface, birds won't have enough momentum to hurt themselves if they do hit the window.

Alter window appearance. If moving attractants is impossible or impractical, you may need to change the appearance of dangerous windows so that birds will avoid them. Problems arise when windows are transparent—providing a seemingly unobstructed flight path, or reflective—providing a mirror image of the vista they face. By examining windows around your home or office, you may be able to determine how these surfaces are deceiving passing birds.

If your problem windows are transparent, try making them appear less so by changing the light inside the house. Pull a shade, close the curtains, or open or close a door. Also, try to place indoor attractants, such as house plants and Christmas trees, away from windows so they won't confuse passing birds. Victims of nighttime strikes seem to be attracted by light. Turning off lights or drawing drapes or shades will prevent these collisions.

You can also render transparent windows more visible by uniformly covering the glass surface, either inside or out, with objects separated by 4 inches or less. Almost anything may be used—sheets of paper, strips of cloth or cardboard. Owl decals or hawk silhouettes work, not necessarily because they look like predators, but because they make the clear surface visible.

Building designers and persons remodeling their homes should consider installing windows at an oblique angle rather than the conventional vertical position. Angle windows so that they reflect the ground instead of the facing habitat and sky. Birds are less likely to fly into an illusion of the ground than into one of sky or trees.

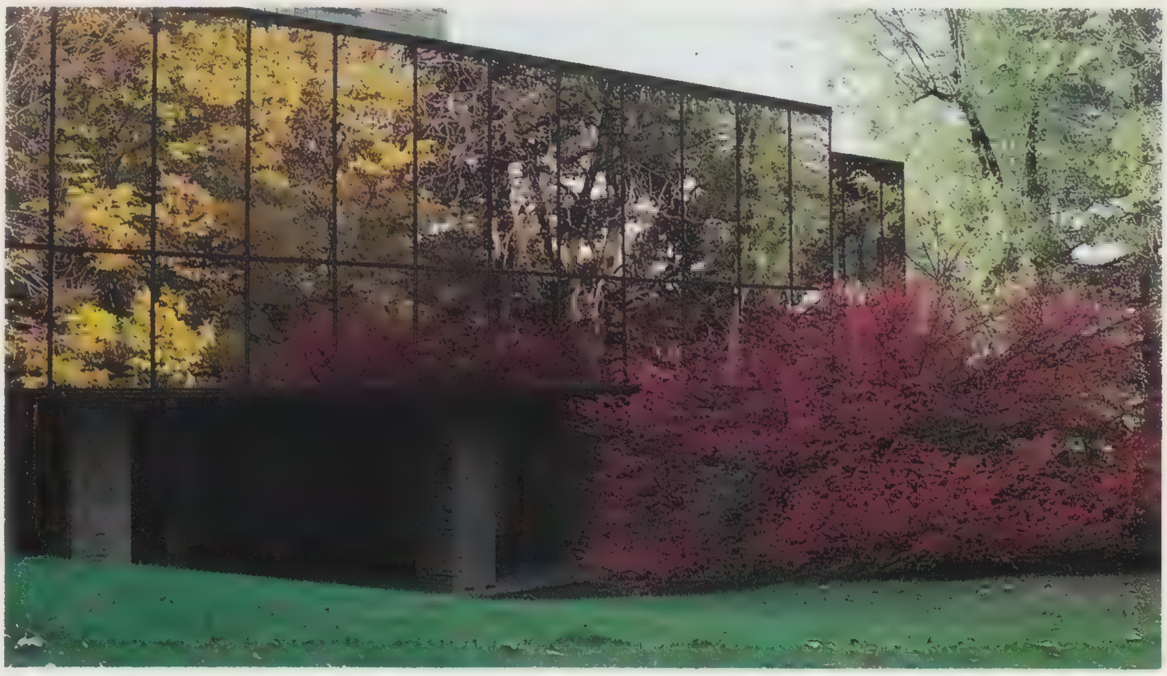
Reflective surfaces. Windows that mirror the habitat in front of them must be altered from the outside. As a temporary measure, you can paint the window with soap or wax, or try affixing strips of paper or cardboard. Also effective are ribbons, colored strings, or mobiles hung in front of the window. These objects are most effective when they cover the window and are about 4 inches apart. Anything you can do to uniformly disrupt the window's mirrorlike quality will help to prevent accidents. A word of caution: consult the manufacturer before attaching objects to thermopane windows.

Another solution is to place nylon, dacron or gauze screens or netting over the window. These do not obstruct the view, and birds may continue to fly into the window, but they will bounce off the screen unharmed.

Administer first aid. Birds don't always die when they hit windows. Sometimes they fly away immediately; other times they fall stunned to the ground. If you find a stunned bird, place it on the window ledge where you can oversee its recovery, or take it inside where it will be safe from predators. Place it in a closed box or paper bag where it can rest quietly in the darkness until it revives. Release it as soon as it appears awake and alert.

Routinely check under windows. You may not know you have a problem window, so periodically check outside. By moving a feeder or changing the appearance of your windows, you may prevent untold numbers of needless deaths.

Daniel Klem, Jr. is an assistant professor of biology at Muhlenburg College, Allentown, Pennsylvania, and has studied window-bird collisions for almost a decade.



DANIEL KLEM, JR.

RESEARCH & REVIEW

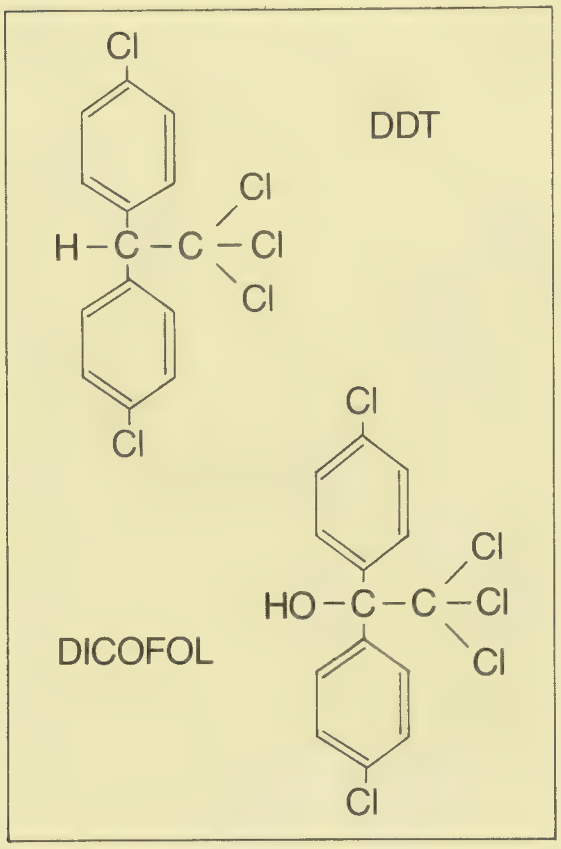
Richard E. Bonney, Jr.

DDT IN THE 1980s
You may be using it in your yard

DDT is probably the best known insecticide ever used in the United States. For three decades the highly toxic chemical was sprayed far and wide to control pest insects, especially mosquitoes. But the chemical had a serious flaw: it worked too well.

Not only did DDT kill mosquitoes and other pest insects, it also killed beneficial insects and other invertebrates, such as worms. It killed birds, such as song sparrows and robins, that ate the poisoned insects and worms. And as the deadly chemical continued to infiltrate food webs, it became concentrated in the fatty tissues of many animals, including humans.

In 1962 Rachel Carson woke the country to the dangers of DDT in her famous book *Silent Spring*, and a decade later the United States government prohibited virtually all uses of DDT after studies showed it was causing reproductive failure in several endangered species, including the osprey, bald eagle, peregrine falcon and brown pelican. After another decade the effects of the ban have become noticeable; in many areas, environmental levels of DDT are finally low enough so that ospreys and other species, though greatly diminished in numbers, are again breeding successfully.



But DDT has not disappeared. In some parts of the country its concentration has not dropped at all, and in other areas it has increased. In San Francisco, for example, a market basket survey conducted by the Natural Resources Defense Council in 1984 found that DDT was the most common pesticide residue detected on local produce. In Texas in 1983 state health officials found that fish in a river called the Arroyo Colorado are so heavily contaminated with DDT that they are unsafe to eat. And a nationwide study conducted by the National Center for Disease Control in 1983 found detectable amounts of DDT in *all* subjects tested, including humans. Where is the DDT coming from?

Some of it could be residual, a legacy of 30 years of legal use in America. Some could be from farmers or ranchers who buy it on the black market. But even worse, DDT is still being used legally in this country as an ingredient in another insecticide—dicofol—which is probably sold in your local garden store.

HISTORY

First approved for use in the United States in 1957, dicofol is an ingredient in nearly 200 federally registered pesticide products designed for a variety of commercial and home uses. Dicofol is manufactured from DDT, and because the manufacturing process is imperfect, not all of the DDT is converted to dicofol. Therefore, dicofol contains measurable amounts of DDT and DDT-related byproducts. One of these byproducts is DDE, which is highly toxic to wildlife and is responsible for past reproductive failures in ospreys, bald eagles, peregrine falcons and other birds.

The Environmental Protection Agency (EPA) banned the use of DDT on June 14, 1972, citing the chemical as an "unacceptable risk to man and his environment." At that time, dozens of pesticides containing DDT were taken off the market. Dicofol was not, apparently because DDT wasn't listed as an active ingredient. EPA, in fact, approved the registration of dozens of new dicofol products after the 1972 DDT ban. These included Kelthane, a widely used insecticide that contains from 7 to 15 percent DDT and DDT-related compounds. EPA officials have stated that the agency did not realize that these products contained DDT until 1979 when the ingredients of dicofol were examined in a routine review.

USE

Dicofol is used primarily to kill mites—tiny, spiderlike creatures that feed on plants, causing brown or reddish splotches and reducing a plant's ability to make food. Mites usually are washed away by heavy rains, but during dry periods they can reproduce very rapidly, causing a great deal of damage to crops and ornamental plantings.

Nowhere is mite damage greater than in California cotton fields and Florida citrus groves, which receive more than half of the 2.5 million pounds of dicofol sprayed in the U.S. each year. It is easy to understand why growers use the chemical: serious mite infestations greatly reduce crop yields. An outbreak of the citrus rust mite can do so much damage to orange or grapefruit skins that the grower is forced to sell the fruit for concentrate rather than on the more lucrative whole-fruit market. Dicofol also is used on Maine apples, Virginia grapes, South Carolina peanuts, and Washington alfalfa. In total, about one million acres of cropland are sprayed with the chemical each year.

Dicofol also is sold to nursery growers and homeowners. ChemLawn, an Ohio-based company that provides residential tree and shrub care, estimates that between 1979 and 1984 it made 854,600 applications of dicofol throughout the U.S. and Canada, and dicofol is an ingredient in dozens of retail pesticides intended for use on home vegetable gardens and ornamental plantings.

DICOFOL AND DDT

For about seven years following the DDT ban, studies indicated that concentrations of the pesticide were declining in nearly all species. Then, in 1979, the U.S. Fish and Wildlife Service's (USFWS) annual monitoring program showed that concentrations were stabilizing in migratory birds tested in New Mexico and western Texas. Further tests, completed in early 1984, showed that DDT levels were increasing in some fish and migratory birds.

In the Arroyo Colorado in Texas, where DDT levels should have declined to one or two parts per million (ppm), the USFWS found levels as high as 40 and 50 ppm in some fish. In California, heavy concentrations of the pesticide have been found in fish and mussels in the Salinas River Valley, south of San Francisco. And in Arizona and New Mexico, tests have shown that concentrations of DDT are increasing in the tissues of starlings.

Is the DDT coming from dicofol? Some say no. Officials at Rohm and Haas, the company which manufactures more than two-thirds of the dicofol used in this country, suggest that the DDT found today may be coming from river sediments where the chemical was deposited before the ban, or from DDT-contaminated dust blown in from Mexico. As support for these ideas they point to areas of New Mexico where high levels of DDT have been found recently, but little or no dicofol is used, and to parts of Florida where dicofol is used heavily yet little or no DDT contamination has been reported.

Another possible source is the black market. The USFWS believes that some U.S. farmers obtain DDT from Mexico where it is still manufactured legally. USFWS also feels that migratory birds ingest DDT on their wintering grounds in South or Central America.

The EPA, however, believes that dicofol is an important source of rising DDT levels. The agency has pointed out that many regions with high levels of DDT are areas where dicofol is heavily used. Some dicofol products contain up to 15 percent DDT-related material, more than was present in some DDT-based pesticides banned in 1972. The EPA estimates that the 2.5 million pounds of dicofol used each year release about 250,000 pounds of DDT and related compounds into the environment. While this is a small amount compared with the 12 million pounds of DDT used each year in the early 1970s, the effect still could be significant. The EPA believes, for example, that dicofol alone may account for about half of the DDT compounds found in the contaminated fish of the Arroyo Colorado, which runs through the heart of the Texas citrus belt.

THE CONTROVERSY

Why didn't the EPA ban dicofol in 1979 when its DDT content was discovered? Apparently there was some disagreement within the agency. Clayton Bushong, then chief of EPA's hazard evaluation branch, felt that the 1972 DDT ban covered all products containing DDT, but his superiors disagreed. They stated that the ban did not apply to pesticide ingredients classified as byproducts. Therefore, no immediate action was taken against dicofol.

By early 1984 the EPA had become more concerned about the pesticide. Some studies had been completed indicating that high levels of DDT were still present in the environment, and the agency began a special review of dicofol. In October 1984 the EPA stated that use of dicofol, together with ex-

SOME PESTICIDES THAT CONTAIN DICOFOL

Clean Crop Dicofol 4EC	**42.0%**
Kelthane MF	**42.0**
Helena Dicofol 4E	**42.0**
Lanco Dicofol 4EC	**42.0**
Dicofol 4EC	**41.1**
Kelthane 4F Flowable	**41.0**
Kelthane 35	**35.0**
Acme Kelthane Red Spider & Mite Spray	**18.5**
Clean Crop Dicofol 1.6-EC	**18.5**
Pratt Mite Spray Containing Kelthane	**18.5**
Rigo Red Spider Mite Spray	**18.5**
Kelthane EC	**18.5**
Science Kelthane EC	**18.5**
SA-50 Kelthane EC	**18.5**
Kelthane EC Miticide	**18.5**
Security Kelthane EC Miticide	**18.5**
Black Leaf Kelthane Mite Killer	**18.5**
Kelthane	**18.5**
Dexol Kelthane	**18.5**
Dexol Red Spider & Mite Spray	**18.5**
Grotone Kelthane EC	**18.5**
Vigoro Kelthane EC	**18.5**
Lanco Dicofol 1.6-EC	**18.5**
Lanco Dicofol EC	**18.5**
All-Mitee EC	**18.5**
Dicofol 1.6-EC Agricultural Miticide	**18.4**
Formula GH-31	**12.0**
Ferti-Lome Mite Spray	**10.3**
Ferti-Lome Red Spider Mite Spray	**10.3**
Hi-Yield Kelthane Spray	**10.0**
Formula GH-21	**10.0**
Flora-Fog Kelthane Greenhouse Fogging Miticide	**10.0%**
Florida Citrus Spray Wettable	**6.8**
Ferti-Lome Citrus Spray	**4.1**
Florida Citrus Spray	**4.0**
Rose Spray	**4.0**
Acme Bagworm Spray	**3.6**
Rose Spray (Garden of South)	**3.6**
Florida Garden Spray	**3.2**
Science Fruit, Nut & Garden Spray	**3.2**
Kelthane Emulsifiable	**3.0**
Ortho Isotox Insect Killer	**3.0**
Ortho Orthenex Insect & Disease Control	**3.0**
Ortho Isotox Insect Spray	**2.0**
Vigoro Multi-Purpose Insect Spray	**2.0**
Acme Kelthane All Round Spray	**2.0**
Superiors Extra Value 2% Kelthane Dust	**2.0**
Security Home Fruit Spray or Dust	**2.0**
Pratt Rose & Flower Dust or Spray	**1.5**
Science Rose & Floral Dust	**1.5**
Tomato & Vegetable Dust in Squeeze Duster	**1.5**
Unico Fruit Spray	**1.5**
Rose Dust	**1.5**
Ortho Rose & Flora Dust	**1.5**
Ortho Rose & Flower Jet Duster	**1.2**
Rose Dust in Squeeze Duster	**1.0**
Security Rose & Flower Dust	**1.0**
Science Systemic Spray	**0.9**

REPRINTED WITH PERMISSION OF THE MIAMI HERALD isting levels of residual DDT compounds, posed "a significant threat to wildlife, especially certain endangered species." The agency also stated that neither phasing out use of the pesticide nor reducing the amount of DDT contamination in the pesticide to one-half of its present level would adequately mitigate the risks to the environment. Finally, the agency said that the economic impact resulting from banning dicofol would not outweigh the environmental risk. Therefore, EPA began formal proceedings to ban dicofol.

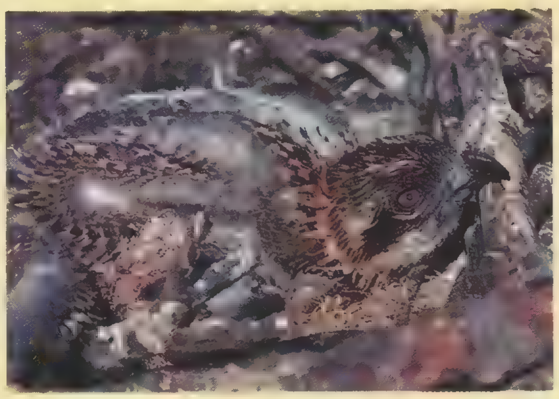
The process was never completed. In a hearing on April 17, 1985, dicofol manufacturers argued that a ban on the pesticide would hurt the farmers who depend on it as a cheap and effective means of mite control, and that other miticides are not as effective. The manufacturers also announced that they had a "novel technology" which would reduce the DDT contamination in dicofol to less than 0.1 percent. This was surprising since the manufacturers had stated earlier that they could not decrease the level to less than 5 percent. Nevertheless, after considering these arguments, the EPA agreed to continue dicofol's registration as long as the manufacturers reduced the DDT contamination level to less than 2.5 percent by January 1986 and to less than 0.1 percent by July 1987.

THE REAL QUESTION

Does 0.1 percent DDT contamination in dicofol pose a threat to the environment? Possibly: the reproduction of certain species has been inhibited by tiny concentrations of DDT. The EPA has stated that it cannot determine whether the cleaned-up dicofol will have adverse environmental effects. The agency's rationale for continuing dicofol's registration, according to spokesman Bruce Kapner, is that the amount of DDT contributed to the environment by the cleaned-up dicofol will not significantly increase the amount of DDT already in the environment.

However, this rationale ignores a larger, more important question: what are the environmental effects of pure dicofol? This question has been very poorly studied, but the EPA does know that the pesticide is highly toxic to aquatic organisms and is capable of causing reproductive impairment in some fish and birds. Furthermore, one study has suggested that dicofol, with or without DDT, may break down into DDE, the same deadly byproduct into which DDT breaks down. If this is true, then spraying dicofol could have much the same effect as spraying DDT.

LAURA RILEY (BRUCE COLEMAN INC.)



Pesticides seeping into waterways from farms and absorbed by fish, ospreys' primary food, had a devastating effect on the population. Recently, however, numbers have increased.

Unfortunately the EPA doesn't know whether or not dicofol breaks down into DDE. Studies to identify and evaluate the breakdown products of dicofol are presently being conducted by the chemical's manufacturers, but tests will not be completed until December 1986. Yet dicofol will remain in use while its effects are studied.

Dicofol is just one of hundreds of legal pesticides which the EPA is supposed to regulate. How many of these are undiscovered environmental threats? At present, the EPA relies on manufacturers' tests to determine whether pesticides are safe. Short on staff and funding, the EPA does virtually none of its own testing and must work with the premise that all pesticides are safe until proven dangerous. Until EPA receives the staff, funding and political support it needs to do a proper job of studying and monitoring pesticides, the DDT saga will be repeated again and again—only with different players and new victims.

BOOK REVIEW

ORNITHOLOGY IN LABORATORY AND FIELD by Olin Sewall Pettingill, Jr. Fifth edition, 1985. Academic Press, Inc. 403 pages. $32.40 (cloth).

This is the newest edition of a classic in ornithological literature. First published in 1939, the book is intended for use at the college or university level, but can be understood by anyone with a basic knowledge of biology and an interest in birds. It is packed with valuable information, tersely written, and well indexed, so specific information about most aspects of birds' lives and habits can be found quickly.

Nearly half the book is devoted to avian form, structure and physiology. Early chapters concern parts of the bird, flight, feather structure and function, anatomy and physiology, and plumages. The text is written to augment examination and dissection of bird specimens.

The middle portion of the book deals with classification of birds into their various groups—orders, families, genera, and species—and identification of birds in the laboratory and field. This section includes an excellent technical key to the orders and families of birds in North America which helps the student to understand some of the structural characteristics ornithologists have used to define these groups.

Pettingill's final chapters discuss behavior, migration, territory, song, mating, nesting, rearing of young, and evolution, and include suggestions for studying these topics which can be used readily by amateurs. For persons interested in censusing birds, directions are given for determining density and abundance.

The fifth edition differs from the fourth in several ways. It includes a new chapter on flight, and two chapters have been rewritten by guest authors—"Behavior" by Jack P. Hailman and "Migration" by Sidney A. Gauthreaux, Jr. The chapter on song has been reorganized and expanded, those on feathers and taxonomy have been significantly revised, and the section on the muscular system has been updated. Also, the synopses of North American orders and families of birds and the identification keys have been reconstructed in accordance with the sixth (1983) edition of the *A.O.U. Checklist of North American Birds*. Other parts of the book also were revised and updated.

Ornithology in Laboratory and Field is not for the casual bird watcher. However, anyone with a serious interest in birds will find it a cornucopia of knowledge, much of which is not well summarized elsewhere. For ornithology students, the book is indispensable.

NEWS & NOTES

Compiled by Steven C. Sibley

EIGHTY-THREE reels of bird-song recordings recently were added to the Laboratory's Library of Natural Sounds. After three weeks in the rain forests of Peru, recordist Ted Parker from Louisiana State University and Laboratory staff member Greg Budney returned with, among others, the sounds of the nocturnal curassow, a species which has been seen by fewer than a dozen persons. The sounds have been added to LNS's excellent collection of recordings of South American birds.

One of the least represented areas in the collection, Southeast Asian sounds, has been bolstered by the addition of 833 recordings made in tropical Southeast Asia by Arnoud B. van den Berg. Van den Berg is a Laboratory of Ornithology Associate and an editor of the Netherlands journal *Dutch Birding*.

AN INTERNATIONAL symposium, "Economic and Social Values of the Wildlife Resource," will be held January 28 to 30, 1986 in Syracuse, New York. Sponsored by the New York Chapter of the Wildlife Society, the purpose of the symposium is to provide a forum where wildlife professionals in administration, extension, education, research, and management can meet and exchange ideas. In addition to formal presentations, several workshops on management techniques are planned. Cooperating organizations include the U.S. Fish and Wildlife Service, U.S. Department of the Interior, the Wildlife Management Institute, and the International Association of Fish and Wildlife Agencies. More information may be obtained from Dr. William Porter, Arrangements Chairman, Illick Hall, SUNY-CESF, Syracuse, New York 13210. (315) 470-6798.

MUCH PUBLICITY has been given to a bill introduced into the Connecticut legislature last spring which would ban instant rice at weddings. Supporters of the bill claim that instant rice kills birds that have eaten it by absorbing moisture and swelling in their stomachs. In fact, instant rice does not kill birds because it absorbs moisture and swells only when placed in boiling water. So next time you're at a wedding, toss away!

PEREGRINE FALCON populations made more gains this past summer. The Peregrine Fund released 125 young peregrines in the eastern United States and another 135 in the West. In the East at least 38 pairs were on territory, and at least 16 of these fledged young, including three pairs which nested on bridges in New York City. Only 27 pairs were on territory in 1984, and there were none as recently as 1979. Since 1975, 752 peregrines have been released in the East by the Peregrine Fund. As many as 400 pairs once bred in the East, but eggshell thinning resulting from the use of DDT, along with increased human disturbance, caused that number to drop to zero by 1961.

The California condor, however, has not done well over the past year. The wild population is now believed to be eight individuals because of the death of several adults over the past year and the capture of one adult to add to the captive breeding program. Capture of the remaining wild birds is now under consideration as an emergency measure.

Dear Member:

Since its earliest days in the mid-1950s, the Laboratory has managed a giftshop for visitors to Sapsucker Woods. Sally Hoyt Spofford, the Laboratory's first executive secretary and receptionist, remembers the shop this way:

"Initially the university was hesitant about the possibility of our competing with local bookstores, but soon realized that our shop would be more specialized, and that the more we sold, the better the chance the Laboratory would move into the black.

"At first we had not even a cash register. Along with being host for visitors, handling Laboratory accounts, answering mail about bird identification and other bird problems, conducting tours of the building, I handled the sales. I had envelopes—one for book sales, one for record sales, one for slides, one miscellaneous, and money received was placed in the appropriate envelope."

As the number of Laboratory members grew, we began sending out a mail order catalogue at Christmas. The volume of orders increased, but was still small enough to be handled by the receptionist in her spare time. Then, in 1982, the shop began to grow in earnest, and was given its own name, The Crow's Nest. Its full-color catalogue reflected the significant expansion in the amount of merchandise it carried, and sales that year rose dramatically. Now we have three full-time employees managing the shop, and processing, filling and shipping orders. Sally's envelopes have been retired, and the whole bookkeeping system and inventory of over 400 different items are computerized. This year we are planning three catalogues, two in the fall and one in the spring.

We view The Crow's Nest Bookshop as an important part of the Laboratory's operations. The profit we make on sales directly supports our research and education programs such as the Library of Natural Sounds and Cooperative Research. We also hope that the bookshop provides a useful source of bird-related items for you, our members. We try to stock a large assortment of bird books, especially field guides, as well as a selection of records and gift items. All these are available at a discount to our members. We also stock unusual products that are not easily found elsewhere, for example, the photographic blind. In the future we plan to offer others, such as a relatively inexpensive tape recorder, parabolic microphone and earphone set for recording bird songs in the field.

Our aim is to make The Crow's Nest a source for all your birding needs. In addition to variety and the unusual, we try to offer friendly, efficient service and prompt delivery. We welcome any suggestions you may have about our service or stock. Are there other things you would like us to carry? Send me your ideas and I will pass them along.

We hope you are among our customers this Christmas. As business grows, increased revenues will help us to expand our programs and services to our members. We are grateful for your help.

***Charles Walcott*, Executive Director**

Audubon's Intentions

MARC BRESLAV

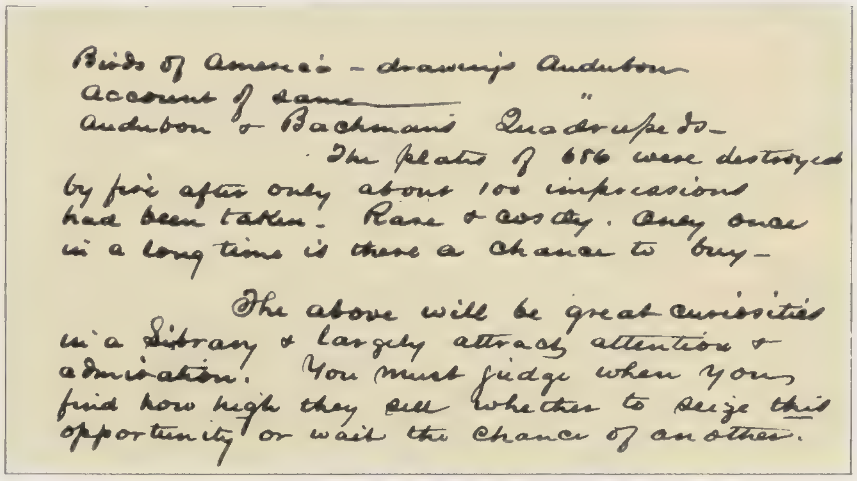
Admirers of John James Audubon have been celebrating the 200th anniversary of his birth for much of the past year. Across the country there have been festivals, exhibitions and special publications in his honor. But among the hullabaloo, a birthday present the artist would have truly appreciated is being created, a realization of part of his own irrepressible dream: the American Museum of Natural History and Alecto Historical Editions are reissuing six of Audubon's original copperplate engravings for *The Birds of America.*

The Birds of America, completed in 1838, is one of the most famous and valuable books created in the New World. It was a monumental project, created by an artist and naturalist whose perseverance has finally won out over early misfortunes.

Naturalist-broadcaster David Attenborough, writing in the *London Observer,* called the plates from *The Birds of America* "arguably the most remarkable and certainly the biggest engravings of birds ever produced.... The reissued engravings," continued Attenborough, "could well be judged to be an even finer representation of [Audubon's] original intentions than any produced during his life-time."

What were Audubon's intentions? Faced with bankruptcy in 1819 from poor business fortunes, he conceived of the *Birds of America* project that was to occupy him for the next 20 years—to seek out every bird species in America, prepare a catalogue of them, and illustrate every one from sketches made in the field. Once painted, the portraits were to be engraved and printed in color on a scale known as double elephant, 29½" × 39½", the largest format of paper then available.

Unable to find backers or a suitable printer in America, Audubon set sail for England in search of both during the spring of 1826. Though he found no investors, he sold subscriptions to finance his publication, and contracted an Edinburgh engraver, William Lizars. Beginning with the plate *Wild Turkey, male,* Lizars engraved and printed the first 10 plates. A labor strike soon forced him to halt work. Apparently unfazed, Audubon moved the project to London, where Robert Havell and his son reworked the Lizars plates and completed the remaining 425.



Birds of America's – drawings Audubon
account of same ——— "
Audubon & Bachman's Quadrupeds –
The plates of 686 were destroyed
by fire after only about 100 impressions
had been taken. Rare & costly. Only once
in a long time is there a chance to buy –

The above will be great curiosities
in a Library & largely attract attention &
admiration. You must judge when you
find how high they sell whether to seize this
opportunity or wait the chance of another.

Havell used a technique common at the time. He engraved the birds and their backgrounds on large copperplates, many bigger than two by three feet, using Audubon's paintings as a reference. The plates were then printed in black ink and colored by hand with watercolors. Although Audubon was pleased with Havell's engravings, he frequently complained about the quality of the coloring. Because of time and money limitations, the colorists sometimes cut corners. Indeed, modern-day comparisons of two prints from the same plate often show marked variation in color. For example, some prints of the *Wild Turkey, male* are much more heavily colored than others, and fetch a correspondingly lower price.

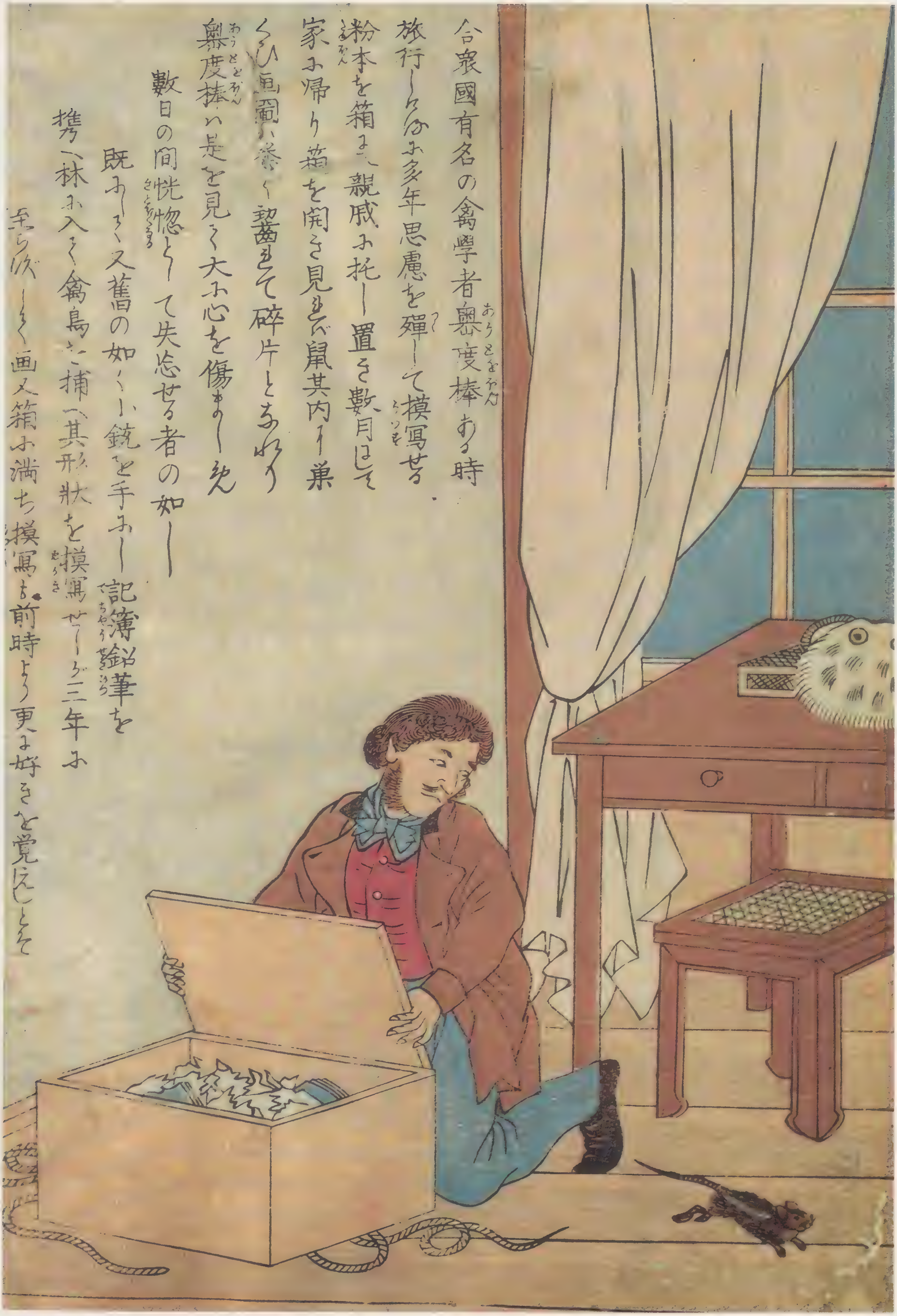
In 1839, with the plates completed, Audubon shipped them to America where he planned to create a second edition to raise additional funds. He insured the plates for $5,000, a large sum for the time. According to one unsubstantiated account, the ship carrying the plates sank just before arriving in New York, and several months passed before a salvage operation was undertaken. It is known, however, that Audubon consigned the plates to a "Mr. Hall's store" for storage, where many of them were damaged in a fire in 1845.

Aubudon died in 1851, before attaining his goal of producing the second edition. His widow, Lucy, attempted to sell or give the plates to various national institutions to no avail. Facing financial difficulties in 1871, she attempted to auction the plates as art, succeeding only in selling most of them as scrap metal.

"There is something almost sad," reported *The New York Times* in March of that year, "that the original plates of that magnificent work, Audubon's 'Birds of America,' were recently sold in this city for their value as old copper, after having vainly sought a purchaser upon their artistic merits."

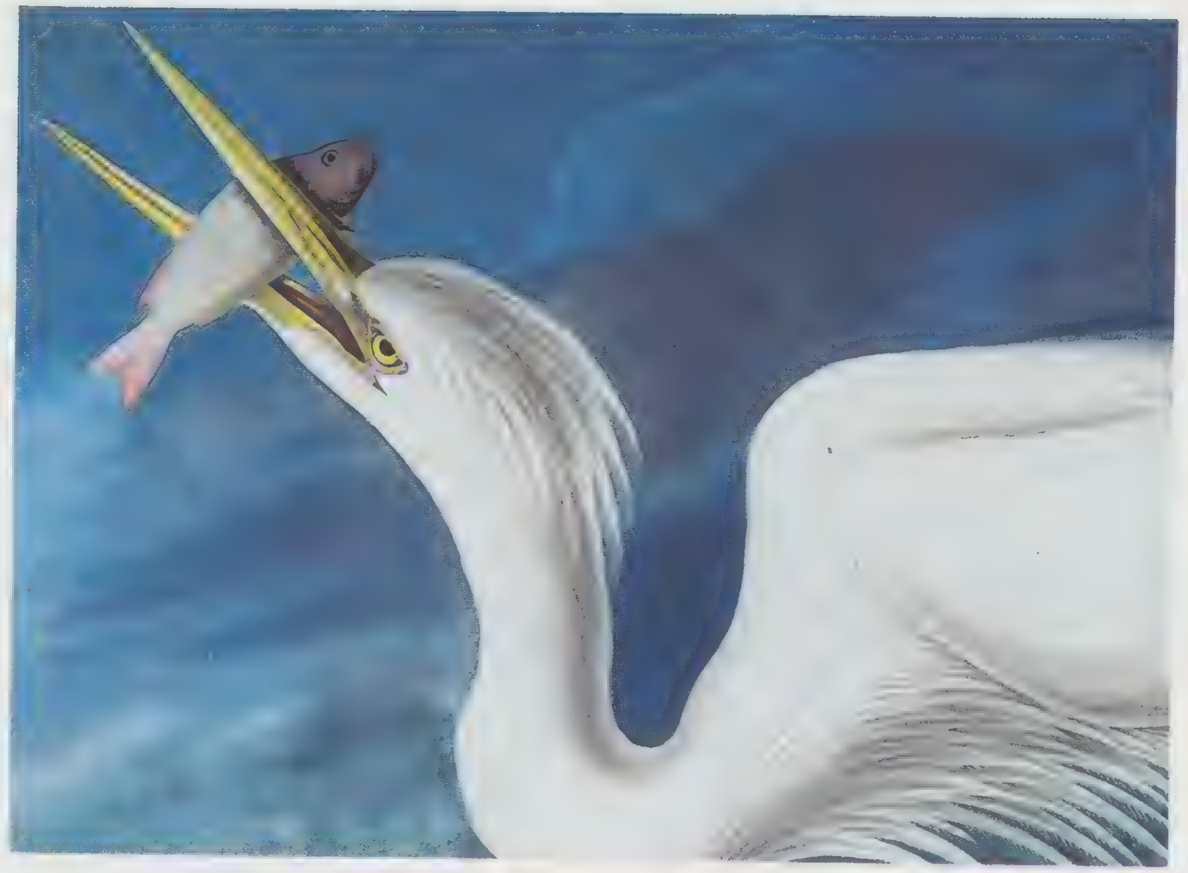
Fortunately some of the plates were snatched at the last moment from the furnaces of the Ansonia Brass and Copper Company in Connecticut. According to some accounts, the person responsible for rescuing the plates was William Dodge, president of the company. Dodge is thought to have given nine of the salvaged plates to the American Museum of Natural History, of

Two documents attest to Audubon's reported bad luck—a letter of 1865 to Ezra Cornell from one F. M. Finch mentions the fire which destroyed many Audubon plates. Right, a Japanese illustration shows Audubon opening a box of his sketches to find that rats have used them as nesting material.

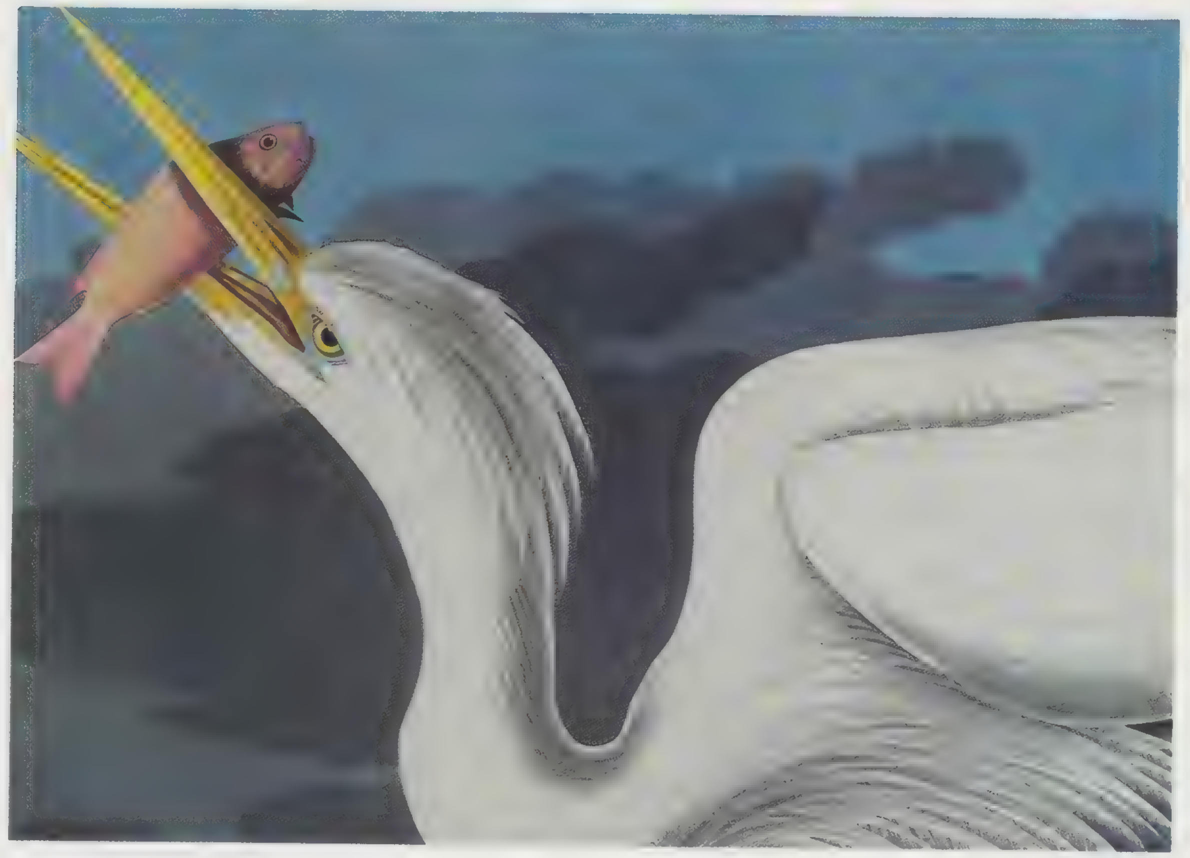


合衆國有名の禽學者奥度棒（おうとぼん）ある時
旅行しけるに多年思慮を殫して摸寫せる
粉本を箱に入れ親戚に托し置き數月ほどて
家に帰り箱を開き見れバ鼠其内に巣
くひ画圖ハ殘らず齧りて碎片となれり
奥度棒（おうとぼん）ハ是を見て大に心を傷ましめ
數日の間恍惚として失忘せる者の如し
既にしてまた舊の如く小銃を手にし記簿鉛筆を
携へ林に入りて禽鳥を捕へ其形狀を摸寫せしが三年に
至らずしてまた画又箱に満ち摸寫も前時より更に好きを覚えしとぞ

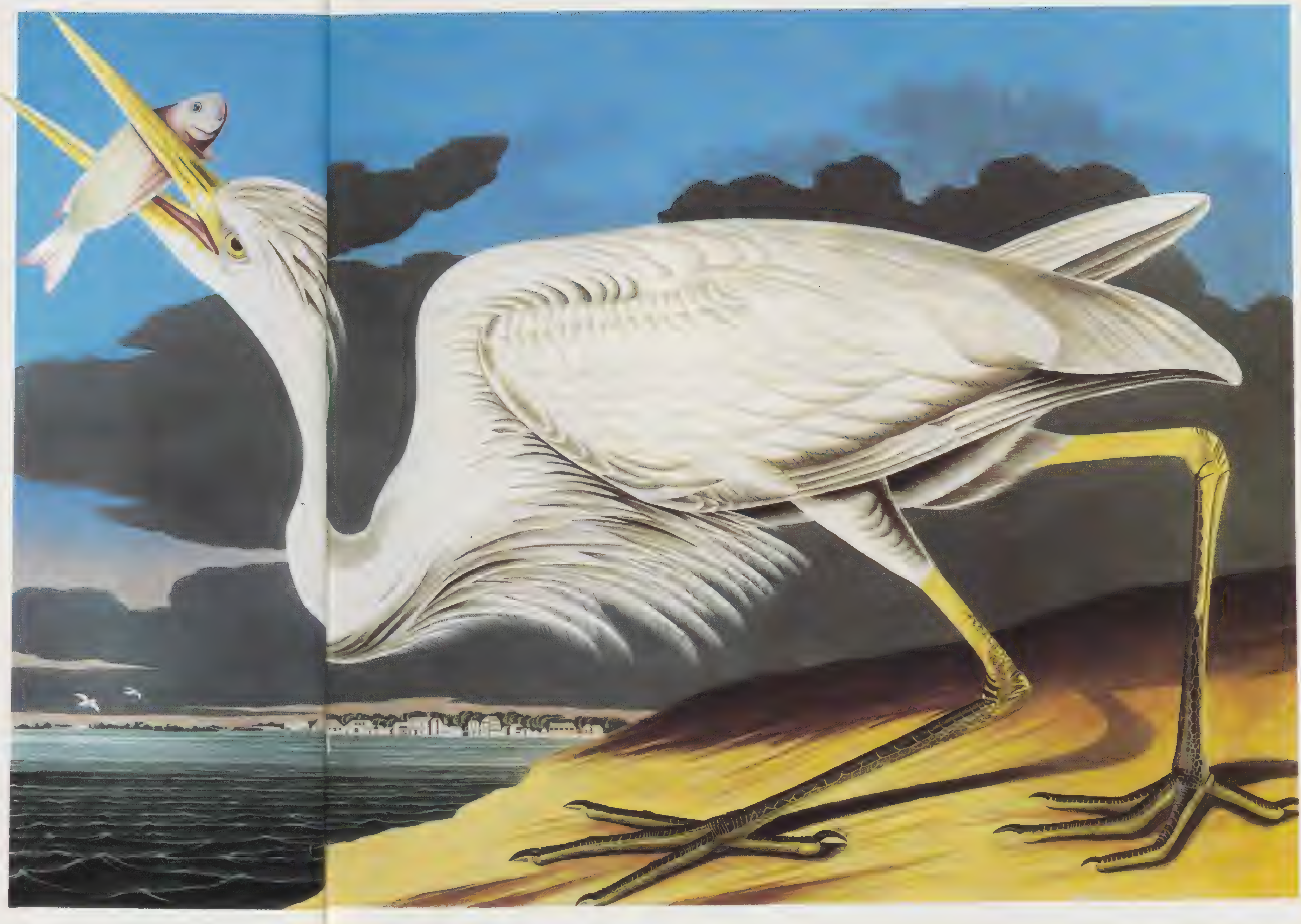
LEE BOLTIN (THE NEW-YORK HISTORICAL SOCIETY, NEW YORK CITY)



COURTESY OF THE NEW-YORK HISTORICAL SOCIETY, NEW YORK CITY



AMERICAN MUSEUM OF NATURAL HISTORY



AMNH/ALECTO HISTORICAL EDITIONS © AMNH 1985

Compare Audubon's Great White Heron. Top left is his original watercolor, and below is a print from the first edition of The Birds of America. *Above is the new reissue. The colors in the reissue are intended to closely resemble the original watercolor.*

which he is a founder. He also gave two to Audubon's granddaughters, and kept one or two for himself. Sometime in the 1880s the granddaughters donated theirs to the museum, and in 1979 Dodge's grandson gave *Wild Turkey, male* to the museum, bringing its holdings to 12. Only about 75 of the original 435 plates are known to still exist; the others are presumed to be lost or destroyed.

A few years later, British publisher Joseph G. Studholme entered the picture. He was at the American Museum to make arrangements for an exhibition of Joseph Bank's *Florilegium*, a series of over 700 copper engravings from the 18th century, which illustrates botanical specimens discovered on Captain Cook's voyage to Australia. The engravings had been discovered in a storeroom of the British Museum (Natural History), and Studholme's firm, Alecto Historical Editions, had begun the task of printing them for the first time.

Through a fortunate circumstance, Studholme met Douglas J. Preston, the museum's publications manager and instigator of many of its recent publishing ventures.

"The museum had been looking for a long time into the possibility of reprinting even one Audubon plate," said Preston. "But it seemed to be too big a project—there was no press large enough to accommodate the plates, and no one we felt we could trust with these national heirlooms. Then we learned of Alecto, whose *Florilegium* project was on an even larger scale, and whose letters of recommendation were absolutely glowing." A co-publishing arrangement was born under the sharp eye and direction of L. Thomas Kelly, publisher of the museum's *Natural History* magazine.

The six finest plates in the museum collection were selected. They are *Wild Turkey, male, Snowy Owl, Canada Goose, Wild Turkey, female and young, Mallard Duck,* and *Great White Heron.*

Audubon had always wanted to reissue his prints. "We're trying to duplicate Audubon's intentions," said Preston. "No amount of time or money is being spared—we made a decision to do whatever was necessary to do it right—as Audubon would have wanted."

The expenditure of time and money was also justifiable as good business. The edition is limited to 125 sets, printed in the same near life-size dimensions as the original double-elephant folio. The portfolios are being sold by Alecto for $30,000, reasonable considering the market price for original Audubon prints. Original prints of the same six plates fetched $145,200 at an auction two years ago, and earlier this year one of the 132 complete *Birds of America* sold for $1.54 million.

Royalties from the sale of the portfolio will be used to endow a fund for natural history at the museum in Audubon's name. When the tabs are in, the reissue project may well have generated more income than any other discrete project in the museum's recent history.

The potential of financial rewards, however, would not exist without the hard work of a team of people. A myriad of details regarding insurance, transport and proper care of the plates had to be ironed out before the painstaking plate restoration and printing could begin.

"The insurance details were horrendous," said Preston. "Joe Studholme could have no more than two plates in a car or plane at one time. He flew back and forth between London and New York several times, on each occasion

BHL

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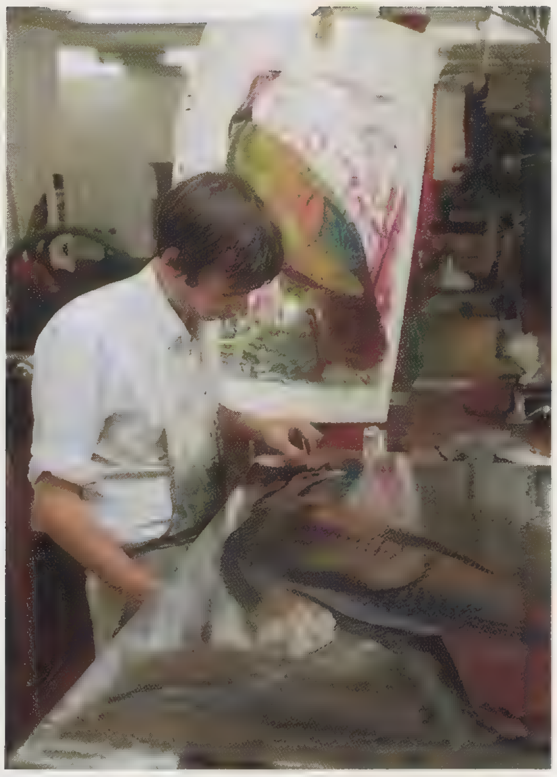
ALECTO HISTORICAL EDITIONS (2)



At Egarton-Williams Studio, London, a test proof of the reissue of Wild Turkey, male, comes off the press. More than a month of proofing is usually needed for best results. Right, a reissued print of Wild Turkey, male.

making special arrangements with airline personnel to bring the huge plates with him in the cabin."

At the Egarton-Williams studio in London where the printing is being done, no more than three plates can be in the studio at one time. The other three must be stored in a vault at a separate location.

The plates were in poor condition when they were donated to the museum, not surprising given their checkered history. There were scratches, dried ink in the engraved lines, blemishes caused by exposure to atmospheric acid and a facing of nickel which had been applied by Havell to protect the soft copper once it had been engraved.

Upon arriving in London about two years ago, the plates were first printed unrestored for historical record. Then the facing was removed. The ink was cleaned out using a special chemical solvent. Usually the ink is carefully gouged out, but a condition of publication was that no mechanical alterations be made on the engraved portions of the plate. "We didn't want to do anything that would impinge on Havell's workmanship," said Preston.

Scratches and their accompanying burrs—tiny mounds of copper created by the scratch—were burnished, but only in non-engraved areas, such as between blades of grass or along a border. The restoration process, said Studholme, "took much longer than we thought it would."

Canada Goose was the worst. "The restorer spent more than 400 hours just working over the copperplate," said Studholme. Among the problems he encountered was a splash of tin, which Studholme said was "fortunately not over an engraved area. . . . We wanted to make sure all the areas on the plate which print white are smooth and carry no ink."

Then came what Preston termed the "incredibly long process of getting the right reference print" for each plate. "We've gone back to Audubon's original watercolors at the New-York Historical Society," he said, in a painstaking effort to match as exactly as possible Audubon's own intentions. Studholme added that 22 or 23 colors were used on the *Wild Turkey, male.* Ornithologists from the museum worked closely with Alecto, checking details of accuracy as precise as the proper color of the inside of a mallard's open bill.

The actual printing technique used by the Egarton-Williams studio is slightly different, but superior to that used by Lizars and Havell. Whereas the latter two struck the print in black ink and then colored the print, the current edition is being printed using a 17th-century technique known as *à la poupée.* A fine rag dabber smeared with hand-mixed colored ink is used to work most of the broad areas of color into the plate's incisions. Thus, when the plate is struck, most of the color is already down, resulting in almost no color variation.

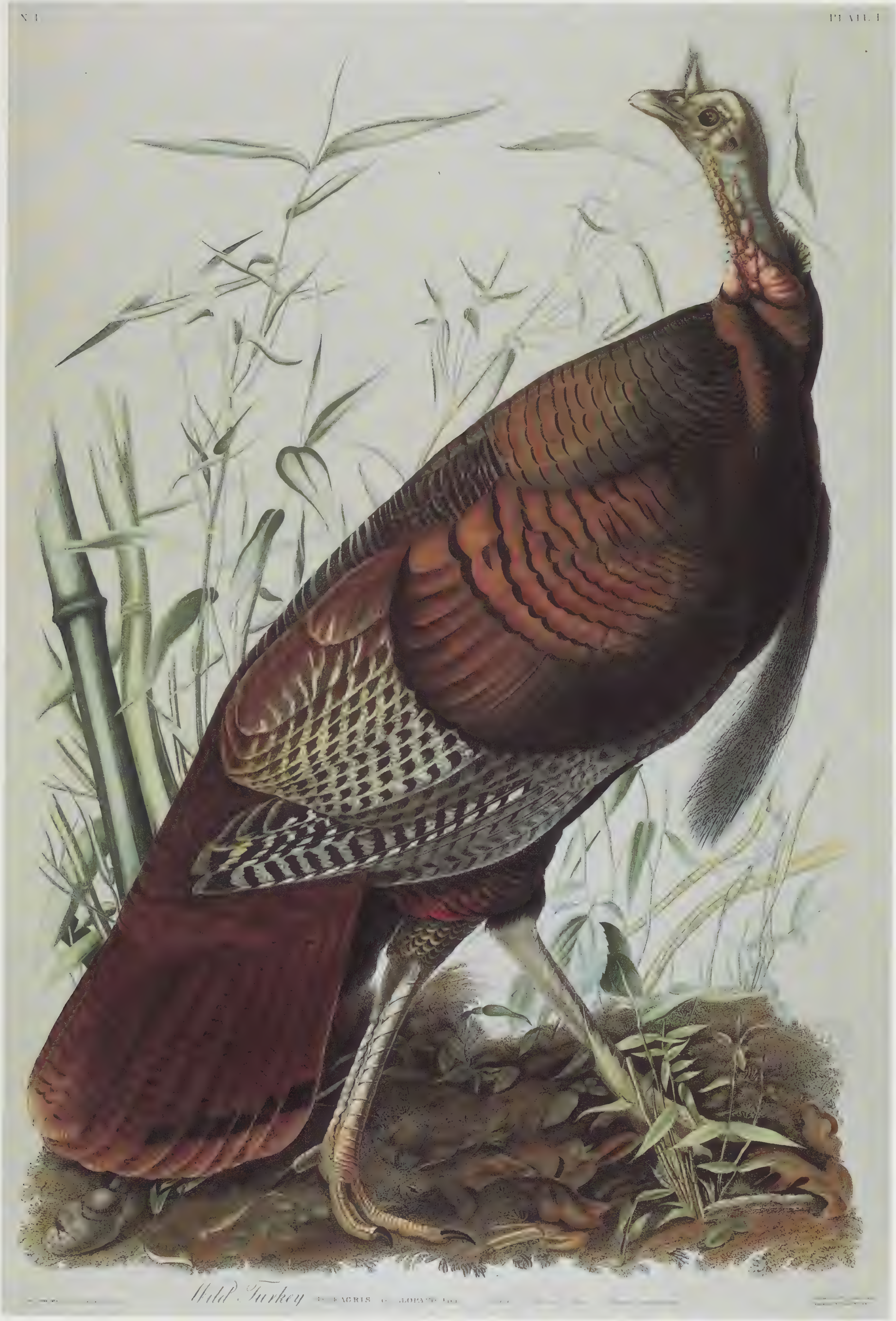
The *à la poupée* technique is the key to why many experts are judging the new edition to be superior to Havell's original prints. Indeed, Audubon frequently complained to Havell about the quality of the coloring. "That's not meant to criticize Havell's studio, which was one of the best in the 19th century," said Studholme, "but he was printing 435 plates and under tremendous pressures of time and money. His approach was within the conventions of the time and as practical and professional as possible. The technique which we're using is actually much older. It must have been known to Audubon and Havell, and we assume they would have used it if the time and money had been available. We were able to do it because instead of making 435, we're making only six."

An original print and the new strike can be compared side by side in a captivating exhibition, "John James Audubon: Science into Art," which opened at the American Museum and will be traveling throughout the United States and Canada over the next three years. Besides gaining a perspective on his art, one can learn some intriguing details about Audubon himself. For instance, he wrote an obituary for his long locks when he cut them to better "sell himself and his book." There is also a Japanese illustration of Audubon discovering a nest of rats in a box of his stored paintings. Given Audubon's adverse fortunes, the nest was made of chewed-up bits of his work. The caption explains that at the time he despaired over the loss, but years later looked back and recognized the replacement paintings he created were far superior to those destroyed. The story circulated widely, as evidenced by the illustration, which was published in Japan in the 1870s, as part of a set designed to inspire perseverance.

Audubon's art has endured death and the test of time. Today, after more than 150 years, his coppers are back in a London studio within walking distance of where Havell first engraved them. Finally, if only in part, his vision of a reissue is being fulfilled.

Marc Breslav is a public relations consultant to natural history and environmental organizations.

All 433 original watercolors for *The Birds of America* are owned by and housed at the New-York Historical Society, 170 Central Park West, New York City. To commemorate the bicentennial of Audubon's birth, the entire collection was exhibited in taxonomic order.


No. 1
PLATE I
Wild Turkey
MELEAGRIS GALLOPAVO Linn.

AMNH/ALECTO HISTORICAL EDITIONS © AMNH 1985

CORNELL UNIVERSITY

LABORATORY
OF
ORNITHOLOGY

ANNUAL REPORT 1984/85

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Executive Director, Laboratory of Ornithology

Dear Member:

So much has happened at the Laboratory over the past year that it is difficult to know what to include in a relatively brief annual report. In the last two reports we have emphasized the Laboratory's programs and staff, but we have made little mention of our administrative board. However, the board is so crucial to the Laboratory that I would like to take this opportunity to describe some of its functions and to tell you a little about each member.

First, some background: the Laboratory of Ornithology is organized as a separate department of Cornell University. The management, control and operation of the Laboratory is entrusted to an administrative board of 26 members, four of whom are selected by the university and 22 by the board itself. In making appointments, the board and university try hard to appoint members with a diversity of talents. We need professional ornithologists to contribute to the substance of our scientific programs, amateur participants to make sure our programs address the needs and interests of birders, and business experts to direct our operations.

Scanning their biographies, one is impressed with the board members' achievements, but hard pressed to find the common denominator, except for their interest and concern for the Laboratory. The list reads like a *Who's Who* and includes corporate executives, biologists, lawyers, university administrators, a carbohydrate chemist, a pediatrician and at least one part-time poet.

It's not even safe to say they all watch birds; **Morton S. Adams,** for example, is more interested in bugs, his passion being butterflies and moths. He's a pediatrician, but he could have been a professional biologist. His understanding of biology from an amateur's standpoint has been very helpful in guiding our education and information program which strives to bring together the experiences of the birder and the knowledge of the ornithologist.

Sam is a visiting scientist in the entomology department at Cornell and has worked with taxonomists at the U.S. National Museum of the Smithsonian Institution. His interest in entomology has taken him to such exotic places as French Guiana and the cloud forests of Trinidad.

Naturally, the board has a few avid bird watchers. **Ann Gaylord,** who describes herself as "a nut on the subject of conservation," has been birding virtually all her life. She started looking at birds at the age of six when her uncle gave her a book by Thornton Burgess. Burgess even signed her first checklist.

Ann lives in Niantic, Connecticut and has been instrumental in the reintroduction of osprey to the Pataguanset Marsh. She has trained families who live around the marsh to monitor nests, and is particularly involved in the Lab's education and information projects. In addition, her concern for conservation has helped us to focus our programs on a broad range of issues.

Rex Bates has a long-standing interest in birding and has participated in Christmas Bird Counts and other cooperative research ventures. His first memories of bird watching are as a Boy Scout in the Pacific Northwest during the Depression.

"We couldn't afford binoculars so we sat in the bushes and attracted birds by whistling," he told me. "After the war, my interest was rekindled when I joined the investment firm of Stein, Roe, and Farnham. Farnham discovered the Michigan nesting place of the rare Kirtland's warbler. We went birding regularly and spent time around Lake Calumet, which is now all industrialized."

Rex is a financial analyst and financial vice president for the State Farm Insurance Company in Bloomington, Illinois, and one of the board's recent appointees. He brings with him a wealth of expertise as a birder combined with an understanding of financial management. We look forward to his advice as we seek long-term support for cooperative research.

Among the board's most avid birders is **Alan Crawford, Jr.,** who also serves on the board of the Hawk Mountain Sanctuary in Pennsylvania. The Lab benefits from his strong interest in raptors and his link to Hawk Mountain, one of the most active raptor observatories in the country. Alan is a partner at Brown Brothers Harriman & Company in Philadelphia, and an investment trustee of the Academy of Natural Sciences and the Wilson Ornithological Society.

Another avid birder is **Joseph Siphron,** who also serves on the board of directors of the National Audubon Society. Joe is a partner at the law firm of Milbank, Tweed, Hadley, and McCloy and belongs to the American and International Bar Associations. He has been instrumental in helping the Lab to forge a closer relationship with the National Audubon Society.

Recordings from the Lab's Library of Natural Sounds stimulated **Clifton Garvin's** interest in birding, and as chief executive officer of the Exxon Corporation, he has been responsible for grants to the Lab that have been crucial to our continued success. Not only does he have a deep commitment to birds, but he shares with us his business acumen. He has been especially generous with his time in helping to formulate a five-year plan for the Laboratory's future. His comments have been invaluable.

For many board members, bird watching is just one of many interests. **Imogene Johnson** is one such member. She devotes time to astronomy, rock collecting, horticulture, fishing, and camping. An engineering mathematician before she married, Gene now serves as the director of the Cable Natural History Museum in Racine, Wisconsin, and chairman of the board at the Prairie School, founded by Gene and her husband. As a member of the Laboratory's education and

SNOWY OWL

©1975 BY CHURCH & DWIGHT CO., INC

GOSHAWK

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SWALLOW-TAILED KITE

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BALD EAGLE

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OSPREY

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RED-SHOULDERED HAWK

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WHITE GYRFALCON

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ROUGH-LEGGED HAWK

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Arm & Hammer Birds of Prey Series © 1975 Church & Dwight Co., Inc information committee, she brings the concerns of a person active in instruction and conservation.

Thomas Hampson combines an interest in birds with a love of music. An attorney with Harris, Beach, Wilcox, Rubin and Levey in Rochester, New York, Tom is also host of weekly radio broadcasts devoted to jazz, writes a music column for *City,* a weekly newspaper, is founder and director of the Genesee Valley chapter of the American Civil Liberties Union, and for 30 years has been a member of the Genesee Ornithological Society. As a member of the board's Library of Natural Sounds committee, he offers the point of view of a birder, musician, record critic, and all-around Lab enthusiast.

Publishing executive **Barnabas McHenry** brings to the board not only an interest in publications and conservation, but in art, music, and ballet. In addition to his role as general counsel and director of the Reader's Digest Association, Inc., he has served as a trustee of the New York Zoological Society, American Museum of Natural History, and Metropolitan Museum of Art. I hope his extensive experience on the boards of other nonprofit institutions will help us to plan for the future.

As an English major at Cornell in the early 1960s, **Edwin Morgens** took his books to Sapsucker Woods so he could study to the sound of birds chirping. Ned has been fascinated by birds since he was a member of the Junior Audubon Society, but is at a loss to explain how an English major with a minor in creative writing ended up as the head of Morgens, Waterfall and Company, Inc., an investment firm. "Fiction was my thing," he told me, "but now I just write poems occasionally. It's a form of recreation."

As a member of the board, Ned has strengthened the Lab by challenging Cornell to provide a three-year matching grant to pay my salary and by serving as chairman of the development committee. His experience in the magazine business and involvement in organizations like the American Museum of Natural History and Ducks Unlimited, have helped put our business operations on a stronger foundation.

The board also has its share of professional biologists who lend expert advice to our programs. For example, **Chandler Robbins,** senior author of *Birds of North America,* is probably familiar to every birder in the country. Chan is a wildlife research biologist at the Patuxent Wildlife Research Center of the U.S. Fish and Wildlife Service in Laurel, Maryland, director of the Bleitz Wildlife Foundation and the Maryland Chapter of The Nature Conservancy, and co-author of *Birds of Maryland and the District of Columbia.* He is most interested in the distribution, migration, and habitat requirements of North American birds, so his knowledge is particularly valuable to our cooperative research program.

An expert in bird population research, **Frances James** has impeccable academic credentials and is valued highly for her professional point of view. She is a professor and curator of birds and mammals at Florida State University's department of biological sciences, president of the American Ornithologists' Union, and a member of the board of directors for the World Wildlife Fund. A new board member, her expertise is expected to strengthen our cooperative research program.

Another newly appointed board member, **Albert Appleton** will be active in the Lab's education and research programs. He is deputy attorney general for the state of New York and an adjunct assistant professor at St. John's University where he teaches environmental conservation. As past president and current conservation chairman of the New York City Audubon Society, Al has been involved in creating a number of new wildlife refuges in New York City.

A pioneer in the study of bird song, **Peter Marler** serves as chairman of the board's committee for the Library of Natural Sounds. He is a professor at The Rockefeller University and a member of the Smithsonian Council. He is regarded as one of the world's foremost authorities on bioacoustics, and will aid us in developing a bioacoustics center at the Lab.

Another researcher in the field of avian communications, **Eugene S. Morton** is a research zoologist for the National Zoological Park at the Smithsonian Institution, Washington, D.C., and an adjunct professor at the University of Maryland. In addition to communication, his work has encompassed the behavioral ecology of neotropical birds. We look forward to Gene's counsel, particularly in the area of bird vocalizations.

As an ornithologist with sterling credentials and a director of the Laboratory for 13 years, **Olin Sewall Pettingill, Jr.** brings to the board a unique point of view. He is author of a widely used college text, innumerable scholarly papers, several guides to bird finding, and a book about penguins. He began making educational films about birds in the 1930s and filmed in Iceland, New Zealand, the Falklands and Antarctica.

"When I got a decent motion picture camera in the 1930s, one of the first birds I filmed was the Atlantic puffin," he told me. "I began showing the film to the public and was amazed at the enthusiastic reaction of the audience. I thought, 'My word, if that's the reaction to puffins, imagine what a film about penguins would do!' "

With that in mind, Sewall set the Falkland Islands as his goal, but, as he put it, "World War II broke up our plans and we went ahead with other projects." After the war, he took his films around the country, "carrying the message of the Audubon Society." His films caught the attention of Walt Disney, who was then producing a "True Life Adventure Series" shown in theaters as short films to accompany the features.

"Walt was quite taken with our films,"

Sewall said, "and I made it a special point to have lunch with him. I said, 'If you want to have penguins in your series, you have to go to the Falklands.' "

So Walt Disney Productions sent Sewall and his crew to the Falklands for six months, and the footage taken there was used in a film called "Islands in the Sea" and on Disney television programs.

Like Sewall, board member **T. Spencer Knight** has had an association with the Lab that is so vital and long-standing, he's nearly a legend. A vigorous man in his 80s, Spence is an ardent bird watcher and photographer. Two of his greatest contributions to the board have been his perspective on Laboratory traditions and his positive attitude. He's got a youthful outlook and a twinkle in his eye and has been enormously helpful in encouraging everyone to do a good job. To Spence Knight, the glass is always half full.

Two of the board's academic members serve as a pipeline to the university, providing the Laboratory with help from Cornell at critical junctures. **David Call,** chairman of the board, is dean of the College of Agricultural and Life Sciences. As such he helps to smooth the way with the university and aids in integrating the Lab's plans with the university's priorities. When **Robert Barker,** a carbohydrate biochemist, began his tenure on the board he was director of the division of biological sciences, was later promoted to vice president for research and advanced studies, and is now provost of the university. As chairman of the board's committee on cooperative research, Bob has been extremely supportive in securing the assistance of the university whenever possible.

The board also has a pipeline to the local community in **Charles E. Treman, Jr.** Charlie lives in Ithaca and is the retired president and chairman of the board of the Tompkins County Trust Company and trustee emeritus of the university. In 1981 he was appointed Presidential Councillor, the highest honor the university can bestow. In 1972, the Tompkins County Trust Company established the Charles E. Treman, Jr. Fund in his honor to benefit the Laboratory. In October 1984, he was appointed an honorary member of the administrative board, a distinction bestowed upon only three individuals.

While Charlie provides local input, **John Dakin** furnishes a West Coast perspective. John is a principal of Kahn Harris Dakin, Inc. of San Francisco and serves as chairman of the Point Reyes Bird Observatory's board of directors. A new board member, he will help to coordinate the Lab's activities with Point Reyes. He is also treasurer of the San Francisco Bay Chapter of The Oceanic Society.

Some of the beautiful paintings by Louis Agassiz Fuertes that now belong to the Laboratory were once the property of the Arm and Hammer baking soda company, and it was board member **John D. Leggett** who acquired these paintings for the Lab. Jack is the retired president of Church and Dwight Company, Inc., the parent company of Arm and Hammer, which distributed "bird cards"—reproductions of Fuertes paintings—with every box of baking soda sold in the 1930s. The cards looked like baseball cards, and on the back of every one was a description of the bird illustrated. Jack found the originals in the company vaults. Most had never been published because they showed birds of prey doing something the company thought improper at that time—eating prey.

Jack serves on the board of the New Canaan Audubon Society and has watched birds in Alaska, Hawaii, Indonesia, New Zealand, Africa and Scotland.

While not an academic, **Charles Webster** is known as "Dean Webster" to the biology students who work at the Lab's Seatuck research program on Long Island. Chuck's vision, leadership and financial support started the Seatuck program. His home is in the middle of the sanctuary, and he has special state and federal licenses to maintain a waterfowl collection for propagation. Retired from the Air Reduction Company of New York, Chuck also raises exotic pigeons.

G. Michael McHugh came to the board as director of Cornell's Adult University and as such originated the Lab's summer courses and supervised seminars in conjunction with CAU. Through a generous endowment, Mike has provided the Lab with an income base to help support its education and information programs. Today, he is owner of McHugh Ornithology Tours which specializes in international bird and nature tours.

All of the Lab's board members are conservationists, but **Hamilton Kean** has the distinction of being a founder of the Natural Resources Defense Council. An attorney in New York City, he served as the council's treasurer from 1973 to 1976 and is involved in a wide variety of civic and legal organizations.

Another conservationist and writer as well, **William Conway,** general director of the New York Zoological Society, expresses feelings about the Lab that all the other board members seem to share:

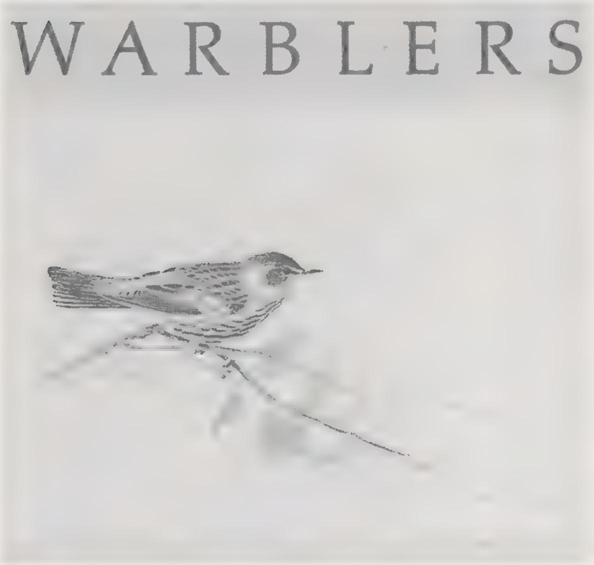
"I see the Lab as a link between the professional ornithologist and amateur, a point of contact where the professional can make information available to the amateur in a compelling way, and a place where the amateur can contribute to the profession. I see it as a seed which is sprouting."

The board consists of a diversity of people with many talents, all united in their concern for making the Lab a vital organization for the study of living birds. They are generous with their advice, criticism and support. All of us associated with the Lab owe them our thanks for their many contributions.

Charles Walcott
EXECUTIVE DIRECTOR

THE YEAR IN REVIEW

Where the administrative board leaves off with advice and guidance, the Laboratory's hardworking staff picks up with a determined will and energetic know-how to bring projects from paper plans to tangible results.



LIBRARY OF NATURAL SOUNDS

- Completed the two-record set of "Songs of the Warblers of North America," the definitive guide to warbler songs.
- Added over 3,000 recordings to its collection, including over 1,000 new recordings of birds from Sulawesi (Indonesia) and 1,000 new recordings from China.
- Completed "Voices of the Peruvian Rainforest," a cassette recording of Peruvian birds and other rainforest sounds.
- With the help of a special board committee, set a goal to establish a bioacoustics center devoted to the study of animal sounds.

COOPERATIVE RESEARCH PROGRAM

- Entered into two agreements with the U.S. Fish and Wildlife Service to determine the status of North American black duck and least tern populations.
- Added 10,000 records to the Nest Record Program, bringing the total to over 280,000 observations of more than 500 species.
- Added more than 2,000 records to the Colonial Bird Register databank to bring the total to more than 13,000 records of 72 bird species.
- Added 10,000 bluebird nest records to the computer databank and continued efforts with an affiliate scientist to determine the status of bluebird populations and to better understand the bird's life cycle.

SEATUCK RESEARCH PROGRAM

- Completed a comprehensive survey of all eastern species of terns and piping plovers on more than 40 Long Island nesting sites.
- Completed a study about the movements and productivity of least terns on Long Island.
- In cooperation with the New York City Audubon Society and the National Park Service, completed a bird habitat management study at the Jamaica Bay Refuge.
- Completed a bird breeding habitat study to look at how different land uses in a suburban environment affect breeding bird distributions and abundance.
- Completed a nest predation study to determine predator/prey relationships within various habitat types.

THE LIVING BIRD
Quarterly

EDUCATION & INFORMATION SERVICES

- Won a gold medal from the Council for Advancement and Support of Education for *The Living Bird Quarterly.*
- Graduated 264 students from and enrolled 493 more in its correspondence course in bird biology, and enrolled 144 students in its correspondence course in bird photography.
- Completed two one-week workshops in field ornithology and bird photography.
- Sponsored the Sapsuckers, the Laboratory's big day birding team, in the second annual New Jersey World Series of Birding. The Sapsuckers tied the National Geographic Society team for the highest number of bird species found by an out-of-state team.

PIGEON NAVIGATION PROJECT

- Played host to visiting researchers from Germany, Italy, and Canada.
- Continued investigating magnetic fields and olfactory cues used by pigeons to find their way home.

OPERATIONAL SERVICES

- Enhanced services to our expanding membership with the new IBM System 36.
- Maintained the Lab sanctuary and trails in a better fashion than ever before thanks to a generous grant.
- Produced three eye-catching catalogues from The Crow's Nest Bookshop which featured a greatly expanded line of merchandise. Along with over-the-counter sales, our shop generated nearly $300,000 in income, a 20 percent increase over last year.

THE PEREGRINE FUND

- Hatched 127 peregrine falcons for release to the wild.
- Identified 38 to 40 pairs of peregrines in the wild, including several long-abandoned nest sites in use again.

ARTHUR A. ALLEN AWARD 1985

The 17th Arthur A. Allen Award was presented in 1985 to Robert S. Arbib, Jr. and Susan Roney Drennan for their corroboration in producing the National Audubon Society's *American Birds.* The award is given by the administrative board of the Laboratory of Ornithology in recognition of outstanding contributions to ornithology.

Since 1967 the Allen Award has been bestowed upon ornithologists whose achievements have set them apart in their field as well as advanced our knowledge and understanding of birds. Bob Arbib, as editor, and Susan Drennan, as associate editor, of *American Birds* have made outstanding contributions to the written interpretation of ornithological endeavors. *American Birds* brings ornithological literature to thousands of amateurs and professionals in a highly readable and enjoyable form.

ARTHUR A. ALLEN AWARD
FOR OUTSTANDING SERVICE TO ORNITHOLOGY

In the words of the awards committee, "We honor Robert and Susan for the important part they have played in bringing amateurs and professionals closer together."

ARTHUR A. ALLEN MEDALISTS

1967	Roger Tory Peterson
1968	James Fisher
1969	George Miksch Sutton
1970	Alexander Wetmore
1971	Peter Scott
1972	Allan D. Cruickshank
1973	Oliver L. Austin, Jr. and Elizabeth S. Austin
1974	Olin Sewall Pettingill, Jr.
1975	Walter J. Breckenridge
1976	Joseph J. Hickey
1977	Jean T. Delacour
1978	Karl H. Maslowski
1979	Chandler S. Robbins
1982	William W. H. Gunn
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Foundation Gifts		16,600
Other Gifts		115,758
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Gross Sales	$293,050	
Cost of Goods Sold	164,800	
Net Sales		128,250
Investments		29,672
Cornell Subsidy		72,454
Miscellaneous		185,988
		919,415
Restricted:		
Library of Natural Sounds		78,628
Cooperative Research		70,891
Seatuck Research Program		140,030
Education & Information Services		36,424
Operations		28,940
Peregrine		162,475
Pigeon Research		70,486
		587,874
Total Income		**$1,507,289**

EXPENSES

Library of Natural Sounds	146,120
Cooperative Research	70,891
Seatuck Research Program	140,030
Education & Information Services	348,501
Operations	389,537
Peregrine	162,475
Pigeon Research	70,486
Development & Membership	198,029
Total Expenses	**$1,526,069**
Excess (deficit)	**(18,780)**
Fund balance 7/1/84	**68,134**
Fund balance 6/30/85	**$ 49,354**

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Quarterly

Winter 1986

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With fewer than 50 birds separating the species from extinction the New Zealand Wildlife Service is attempting to head off the disappearance of this flightless, ground-dwelling, nocturnal parrot.

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Front Cover: Outside–While many birds build distinctive nests, most songbirds construct the standard open cup variety. Twigs and grasses are woven to form the cup which often is attached above a fork in a branch. This nest was found in Michigan. Photograph by John Gerlach/DRK Photo. Inside–Cedar waxwings with apple. Photograph by Gregory K. Scott (Photo Researchers, Inc.). **Back Cover:** Outside–Adélie penguin. Photograph by Art Wolfe. Inside–Barred owl sunning by Jean-Luc Grondin.

MARILYN STOUFFER (PHOTO RESEARCHERS, INC.)

Landscaping for Birds

STEPHEN W. KRESS

YOU can assist wild bird populations by improving the quality of your backyard for wildlife. By planting food and cover vegetation, you can create bird habitats vital to wildlife facing a frightening loss of natural habitat.

The 1980 data from the U.S. Census Bureau reveal that 74-million acres in the United States are covered by urban areas, highways, airports, and parking lots. This area has more than doubled in the past 25 years and now occupies more land than New York, Pennsylvania, Vermont and New Hampshire combined.

Even lands not lost to pavement and suburbia are becoming less attractive to birds. Large farms with few property lines have replaced brushy fencerows, farm woodlots, and wetlands. Such varied habitats are essential to maintaining abundant and diverse bird populations. Trackless horizons of single crop plantings result in a monotony of birdlife. Similarly, in suburban areas natural habitats are often replaced with sterile lawns and pavement. Since most bird species have minimum territory requirements, the remaining woodlands may be too small for nesting.

While the trend toward a monotonous landscape has already claimed several species of North American birds, the toll on plants is even greater. In 1978 the Smithsonian Institution listed close to 10 percent of the 22,200 plant species native to the continental United States as endangered or threatened. According to Peter H. Raven, director of the Missouri Botanical Garden, a disappearing plant can take with it as many as 30 dependent species of insects, higher animals and even other plants. Clearly, protection and management of plant communities are essential if we are to enjoy varied birdlife.

By understanding a few simple concepts, you can turn your yard into a thriving habitat for birds.

Limiting factors. The number of animals that can survive within a piece of habitat is determined by restrictions known as limiting factors. These include food, cover, water, and nesting sites, as well as parasites, predators, display areas, and singing posts. The challenge for anyone who wants to aid bird populations is to strive for a combination of these factors that benefits an increased number and variety of birds.

Limiting factors change from one season to the next. Food may limit numbers in winter, but not in summer. Cover may be sufficient in summer, but not in

Some plants please both people and birds. Flowering dogwood (left) is one of the most important wildlife trees in the eastern U.S., and boxelder seeds are consumed by many types of birds, including evening grosbeaks.

JAN L. WASSINK

VINNIE FISH (PHOTO RESEARCHERS, INC.)

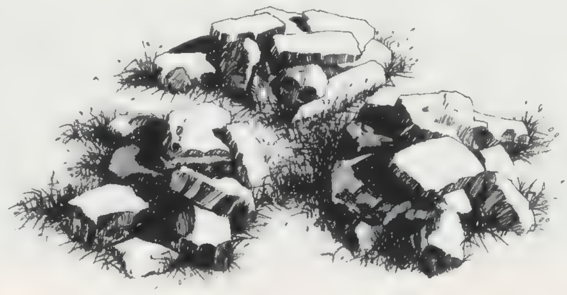
GEORGE H. HARRISON (GRANT HEILMAN PHOTOGRAPHY)

Yards landscaped for birds can be beautiful as well as functional. Baths and pools may attract birds that seldom visit feeders, such as warblers and vireos. Brush piles should be more than piles of brush; place branches over a log, rock, or tile foundation to create a labyrinth.

winter. More nesting cover and food may be useless if the supply of fresh water or suitable nest sites is not adequate. When one limiting factor is identified and remedied, another comes into play. If this too is removed, the population may increase until something else limits growth. Social factors, such as territory size, may limit bird numbers, but even that is not a fixed constraint. Most birds can occupy smaller territories in quality habitat.

The best way to increase wild bird populations is to identify the limiting factors and work to modify them. Although improving backyard habitat through landscaping may be less rewarding at first than attracting birds with a feeder, in the long run it will benefit birds far more. Following are some ideas that provide food, cover and nest sites for birds.

Food plants. Plantings that supply food and cover throughout the year are the most advantageous to backyard birds, yet even properties with abundant plants may offer poor bird habitat. Although lilac and forsythia produce beautiful flowers, for example, their fruits have little wildlife value. Rather than planting just decorative trees and shrubs, encourage plants that are both decorative and useful for attracting birds. Mountain-ash, flowering dogwood, American holly, and winterberry are a few of the many choices that are pleasing to both people and birds.



Vegetation levels. Even within the same habitat, different birds show preferences for specific heights at which to nest and feed. This is most apparent in forests, where some species eat from the ground while others feed high in the trees. Still other birds move among levels. Tanagers and grosbeaks sing and feed in the canopy, but nest in the subcanopy. Chipping sparrows feed on the ground, nest in shrubs and sing from the highest trees. Such movements suggest that backyard plantings should be multileveled.

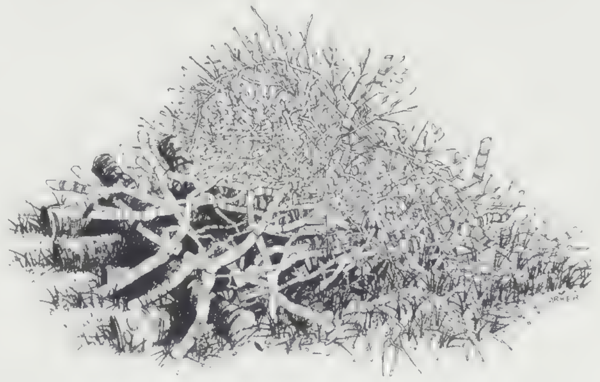
This principle is helpful in a variety of situations. In woodlots, new levels can be created by planting shade-tolerant shrubs and vines at the bases of large trees. The same principle should be considered when selecting border plantings for yards.

Where space permits, you can maximize vegetation levels while providing the most effective visual screening from neighboring properties. First plant tall trees such as pines and spruce. In front of these, plant clusters of smaller trees such as dogwood or serviceberry, followed by tall shrubs such as snowberry, sumac or elderberry. More levels can be made with climbing vines, small shrubs, and ground cover.

Tall conifers such as Norway spruce are best located on the northern border of your property so they can provide maximum shelter from winter winds without excessively shading other plantings. Deciduous trees such as ash and black cherry planted on the south side provide summer shade; in winter, the leafless trees permit sunlight to reach buildings.

Ground cover. A small patch of well-cropped lawn is a useful focal point for viewing birds, but lawn itself, especially rolling fields of it, is one of the most impoverished bird habitats on Earth.

While some birds such as robins feed on earthworms and insects in grassy lawns, others such as towhees, fox sparrows, and white-throated sparrows, prefer feeding among fallen leaves where they can scratch and look for hidden insects. Such habitats are missing from manicured suburban lawns. A good place to create leaf litter is under shrubs and trees where grasses have difficulty growing. Avoid raking these areas, even extend them several feet in front of the shrubs. For color, plant bird-attracting flowers and add a border of flagstone or bricks so that this area looks tidy. Enrich your leaf litter each fall by adding leaves. By spring they will have decomposed into rich soil with an abundance of earthworms and insects for ground-feeding spring migrants.



Further ground cover can be achieved by planting borders and patches of low growing perennial plants such as bearberry, crowberry, and creeping coto-

ART WOLFE

neasters. These plants are more useful to birds than other ground covers such as Boston ivy, pachysandra and periwinkle, which provide little food for wild birds.

Changes in slope. Ground-feeding birds such as sparrows, towhees, and wrens are attracted to abrupt changes in slope. In natural habitats, birds frequently forage along stream banks, rock outcroppings and tree roots since these have a myriad of tiny crevices and crannies in which to probe for insects, worms, and other small animal life.

Artificial changes in slope can be created by building a gently sloping soil mound with a steep rock face, or by creating rock gardens or stone walls. In northern climates, the steep surface of an artificial slope should face south so that the first spring thaw will reveal foraging places previously hidden by snow.

Optimizing edge. Bird variety is usually greater where two or more plant communities come together. This is apparent at woodland borders where thicket-producing shrubs provide an abundance of fruit. Insects are also plentiful here. Many thicket plants, such as mesquite, juniper, hawthorn, raspberries and roses, have spines and thorns which help to create excellent, predator-safe nesting places.

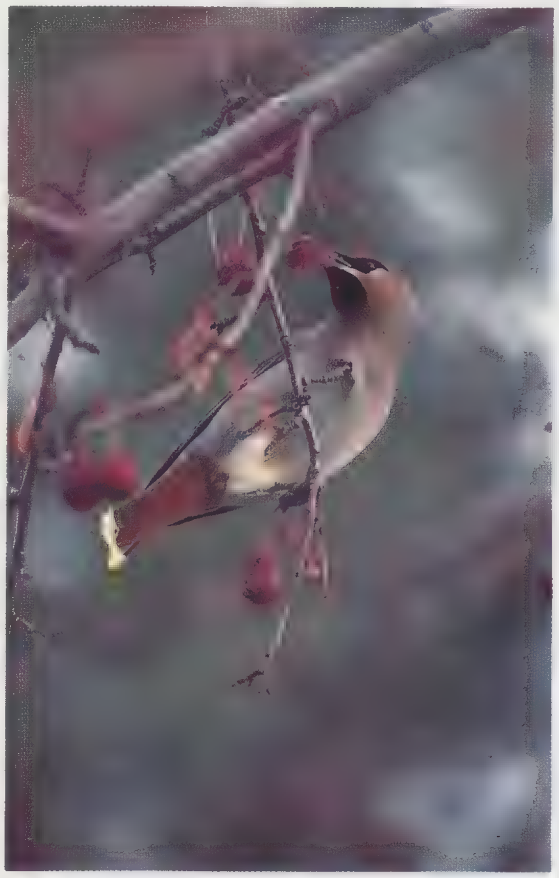
Shrubby edges (hedgerows) are especially important to wild birds because they provide shelter from weather, protection from predators, nesting places, and fruits throughout the year.

Backyard landscapers can replicate the edge effect by planting evergreen hedgerows such as hemlock, juniper or holly along with fruiting shrubs such as red-osier dogwood and chokecherry. The evergreens provide good year-round cover and the fruiting shrubs offer abundant food. Property borders are often a good place to establish hedgerows.

When planting shrubby borders, mix several shrub species to vary height, shape, and density for a greater selection of nest sites. Also select hedge shrubs that fruit at different times of the year to provide an ample food supply throughout the seasons.

Dust bathing. Many kinds of birds including quail, pheasants, birds of prey, kinglets, and sparrows enjoy dust baths. Bathing movements in dust are remarkably similar to those in water, as birds fluff themselves up and flutter in the dust with their wings. The function of dusting is little understood, but it may help to rid the body of parasites such as feather lice.

A dusting area may attract birds into the open for good viewing. Even small backyards can accommodate a dusting area since it can be as small as a foot square. To create a dust bath, excavate soil about 6 inches deep and line the edge with brick or rocks. Create a suitable dust mix by combining one-third each of sand, loam, and sifted ash.



WAYNE LANKINEN

Gardeners should incorporate fruiting plants in landscaping plans. Good choices are (left) blackberries, and crabapples, which attract many birds, like this Bohemian waxwing.

Food patches. Wild plants such as ragweed, lambsquarter, amaranth, bristlegrass, and panicgrass are among the most important wild bird foods. Such weeds usually will establish themselves as soon as the ground is opened by tilling. An excellent way to grow these plants is to establish a wild food patch. Depending on space, this can be a 100 to 2,000 square-foot patch of tilled soil or, if space permits, it can be three strips tilled in rotation so that each strip is used once every three years. Long, narrow patches are preferred over a single large patch because they offer more edge.

Cultivated crops, such as millet and sunflower, can provide concentrated food supplies for wild birds. The simplest way to establish a food patch is to till the soil and broadcast a mixed bag of millet and sunflower seed over the soil. Just 15 pounds of the mixture is enough to seed a half-acre plot.

Food patches should be used to supplement natural food supplies from native meadows, thickets and forests. Like bird feeders, patches are expensive investments. The best long-term way to provide dependable, sustained food supplies is by maintaining food-rich plant communities.

Flowers for songbirds. The seeds of many garden flowers are useful additions to wild bird diets. When selecting flowers for your garden, keep birds in mind and choose some of their favorites. Most of the garden flowers listed will grow in moist, summer gardens throughout North America. Many belong to the sunflower family which explains their attractiveness to songbirds such as goldfinches and native sparrows. Most require an open, sunlit area. Fertilize once a month with 1 to 2 pounds of general purpose fertilizer per 100 square feet. Water, but don't soak, and use mulch to retain soil moisture and to minimize competing weeds. Be sure to let flower heads go to seed for fall and winter food.

Snags. Old forests have a high proportion of dead or dying trees known as snags. Snags provide nesting and roosting sites for cavity-nesting birds ranging in size from prothonotary warblers to turkey vultures.

One way to encourage tree cavities and thus improve young forests for cavity-nesting birds is to drill 2-inch diameter holes 7 inches into the center of dead or dying trees on your property. This will create an excellent beginning for a cavity excavator such as a chickadee, especially if the tree interior is already rotten. Drill entrance holes about 3 inches below stout limbs on leaning trees so that openings point downward. This position provides some protection from rain and may be less conspicuous to predators.

Another way to start tree cavities is to select a limb at least 3 inches in diameter and cut it off about 6 inches from the trunk. As the cut limb rots, the tree will heal around the edges, but it probably will not close over the hole.

Brush piles. Brush piles should be more than piles of brush. A useful foundation will greatly improve the value of the brush pile for both birds and mammals. Several approaches are commonly used to build brush pile foundations, but all rest on the need for animals to have a labyrinth of tunnels in which to hide

ARDEA PHOTOGRAPHICS

from predators and gain shelter from weather. You can create such tunnels by placing four 6-foot long logs (4 to 8 inches in diameter) directly on the ground and then placing another four logs of similar length and diameter perpendicular to the first set. With branch stems pointing toward the ground, pile cut shrubs and pruned branches atop the log foundation to make a peaked mound.

Another approach to building a foundation is to make three rock piles in a V formation, or to construct a brush pile over ceramic drainage tiles. Mound large branches first and add smaller branches to the top of the pile.

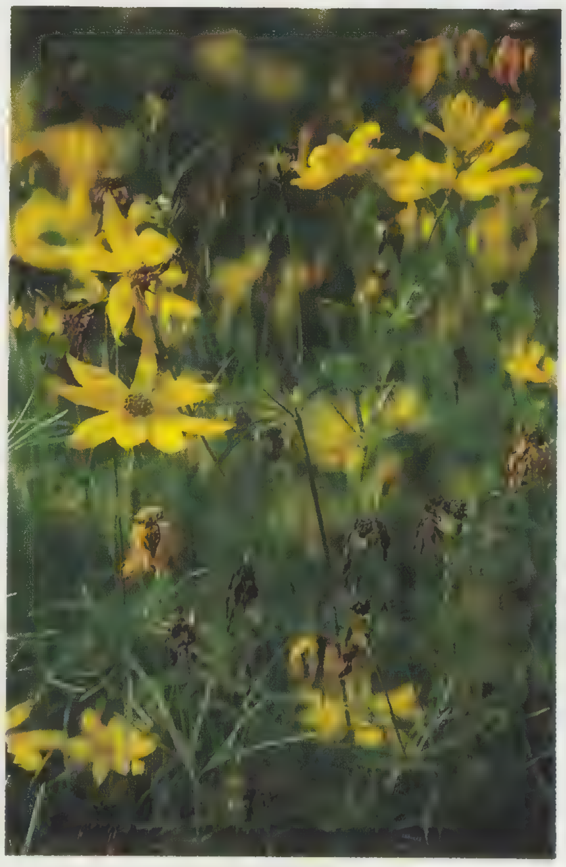
Living shelters can be constructed from a conifer such as spruce or pine with well-formed lower branches. Construct a tepee shelter by slicing the underside of lower branches so that the branches fall to the ground, surrounding the tree trunk. Such shelters provide excellent cover for game birds such as grouse and quail. In winter they may serve as useful places to install supplemental grain feeding stations. If sufficient connecting bark is left intact, the branches may live in their new position for several years.

TIM FITZHARRIS

Birds brighten our lives with their song, color and grace, but their presence cannot be assumed. If we are to leave a rich wildlife heritage for future generations, we must pursue an active and responsible approach to conservation. ☐

Stephen Kress is a staff biologist for the National Audubon Society and an Associate at the Laboratory of Ornithology. This article was adapted from his new book *The Audubon Society Guide to Attracting Birds,* published by Charles Scribner's Sons, © 1985 Stephen W. Kress.

DENIS ROY (VALAN PHOTOS)



BOB GIBBONS (ARDEA PHOTOGRAPHICS)

FLOWERS FOR WILD BIRDS

Asters *(Aster spp.)*
Bachelor's buttons *(Centaurea hirta)*
Basketflower *(Centaurea americana)* *
Blessed thistle *(Carduus benedictus)*
Calendula *(Calendula officinalis)*
California poppy *(Eschscholzia californica)*, choice seed for doves
Campanula (bluebells) *(Campanula spp.)*
China aster *(Callistephus chinensis)*
Chrysanthemum *(Chrysanthemum spp.)*
Coneflowers *(Rudbeckia spp.)* includes black-eyed Susan
Coreopsis *(Coreopsis spp.)* *
Cornflower *(Centaurea cyanus)*
Cosmos *(Cosmos spp.)*
Dayflowers *(Commelina spp.)* *
Dusty miller *(Centaurea cineraria)*
Love-lies-breeding *(Amaranthus caudatus)*
Marigolds *(Tagetes spp.)*
Phlox *(Phlox spp.)* especially *P. drummondi*
Portulaca *(Portulaca spp.)* especially moss rose *(P. grandiflora)*
Prince's feather *(Celosia cristata)*
Prince's plumes *(Celosia plumosa)*
Rock purslane *(Calandrinia spp.)*
Royal sweet sultan *(Centaurea imperialis)* *
Silene *(Silene spp.)*
Sunflower *(Helianthus annuus)* seeds eaten by at least 42 bird species
Sweet scabious *(Scabiosa atropurpurea)*
Tarweed *(Madin elegans)*
Verbena *(Verbena hybrida)*
Zinnia *(Zinnia elegans)*

* *Tolerates shade*
Spp. = several species are available

Shown here, clockwise from top left: marigold, sunflower, coreopsis, black-eyed Susan.

CAMERON BARROWS

Cool Spots in Hot Debate

CAMERON BARROWS

OWL COULD HOLD THE KEY TO $1 BILLION IN TIMBER, read the headline of a 1981 edition of Seattle's *Post-Intelligencer.* Across a photo of a spotted owl was the caption THIS OWL MAY COST $9 MILLION. The accompanying article quoted United States assistant secretary of agriculture for natural resources and environment John B. Crowell, Jr. as asking, "how many owls can we afford to protect?"

This question reflects one of the more controversial conservation questions of the 1980s—at what price do we save the spotted owl? Dubbed "the winged snail darter" because of its potential to impede economic growth, the spotted owl is the focus of an issue that pits the harvesting of timber against protection of this threatened owl. For each parcel of forest that is preserved as spotted owl habitat, a substantial number of trees become unavailable for timber. That translates into millions of dollars of lost revenue for each owl that is protected. What is special about the spotted owl and why has it stirred biological and political debate in the northwestern United States?

Before the 1970s, spotted owls were known only as rare denizens of mature forests of the Pacific Northwest. Concern over the status of spotted owls arose with the realization that those forests were rapidly disappearing in the wake of timber production. Predictions that virtually all old-growth forests would be cut by the turn of the century brought the concern to a head. In 1973, Gordon Gould of the California Department of Fish and Game took the first inventories of the owl in order to determine how rare it was in California. At about the same time, Eric Forsman in Oregon began his investigations into the owl's natural history.

Two facts resulted from these inquiries. First, Gould, Forsman, and others discovered that more spotted owls inhabited the woods than anyone had suspected. Rather than a few hundred, three to four thousand birds were found in California's coniferous forests as well as in southern British Columbia, Washington, and Oregon. That meant some breathing room for those charged with protecting the spotted owl population. Second, the owls appeared to have a strong, if not exclusive, need for old-growth or virgin forests. These forests harbor trees 200 years old and more. In the Pacific Northwest, such forests are dominated by huge Douglas-fir, western hemlock, and redwood trees. Given the high economic value of these forests—virtually all houses in the West are framed with Douglas-fir—the stage was set for conflict between the habitat needs of spotted owls and the desires of lumber interests.

Concern for the future of spotted owls has become increasingly intense among environmental groups. In 1985 the National Wildlife Federation won an injunction to prohibit timber sales in one of Oregon's national forest districts until an environmental impact statement

Predictions that all old-growth Douglas-fir and redwood trees in the Pacific Northwest (right) would be cut by the turn of the century have raised concerns about the future of the spotted owl, above, which depends on these forests for its survival.

is completed which will describe the effects of continued logging on the owl. The National Audubon Society is naming a task force to review the entire spotted owl issue. In addition, the federal government has stepped in with substantial support for research aimed at understanding the needs of the owl.

Forest managers, lumber interests, government bureaucrats and conservationists all wish the owls were not threatened by the continued logging of old-growth forests. Such hopes, however, have not been realized. In fact, Dr. Russell Lande of the University of Chicago suggested at a June 1985 meeting called by the National Wildlife Federation in Portland that the spotted owl already may be on the road to extinction.

I began my research on spotted owls in 1977 with the premise that the birds select certain microhabitats within old-growth forests. I wanted to identify those microhabitats and to understand why the owls sought them out. Observing the owls on their daytime roosts, I noticed a pattern in their behavior; as summer temperatures climbed to 85 degrees and above the owls showed signs of heat stress. This included exposing their toes and legs to permit rapid heat loss. The birds' toes are unfeathered and lose heat more readily than other parts of their body. While exposing their toes the owls release the grasp on their perch. I've had more than one chuckle while watching an owl seemingly forget its lack of footing and nearly fall off its perch. If temperatures exceed 90 degrees spotted owls become severely stressed: they droop their wings and engage in behavior called gular flutter, similar to panting.

Old-growth forests, especially densely wooded ravines where the owls roost, are as much as 10 to 15 degrees cooler than the more open forests that result after logging. During summer, open forest temperatures may reach 100 degrees throughout the spotted owls' range, so the older habitat provides an essential margin of comfort for the owls. The spotted owl's sensitivity to warm temperatures is in part due to its dense plumage. It is this plumage, however, that enables the bird to withstand the cold, wet winters of the Pacific Northwest.

Other researchers, including Eric Forsman in Oregon, and Stephen Laymon, David Solis, Chuck Sisco, and R. J. Gutiérrez in California, have also studied spotted owls' habitat preferences. They too found that the birds almost always selected old-growth forests. Besides being cool, these venerable woods harbor a high density of food items for the owls, and the large, widely spaced trees allow ample flying space beneath the thick canopy. Younger, second-growth forests have fewer snags, which provide nest sites, fewer downed logs, which provide homes for prey, and more young trees, which make flying beneath the treetops hazardous.

Bill LeHaye from Humboldt State University in northern California is presently examining nest site selection in spotted owls. His preliminary findings again point to the owls' need for old growth. They often choose the largest and oldest trees in the forest for nesting. The longer a tree lives, the more opportunity there is for lightning, heavy winds, or disease to create a suitable nest cavity. Since the owls don't excavate their own holes, they depend upon existing holes for nest sites.

There is little doubt that spotted owls prefer old-growth forest habitat. Only rarely are the birds found elsewhere. The owls' special requirements are most pronounced from British Columbia to northwestern California, the prime timber area of western North America. One spotted owl pair uses an average of 1,000 acres of old-growth forest; that's $18-million worth of wood paneling and 2″ × 4″ studs.

Can we have timber and owls too? Yes, but in order to meet the needs of all concerned, a balance must be struck. How much old-growth forest can we cut and still maintain a healthy owl population? Wildlife managers at the U.S. Forest Service are grappling with this question.

Old-growth forests are extremely valuable for lumber (left). The densely feathered spotted owl (below) seems to prefer these woods because they are cooler than young forests.

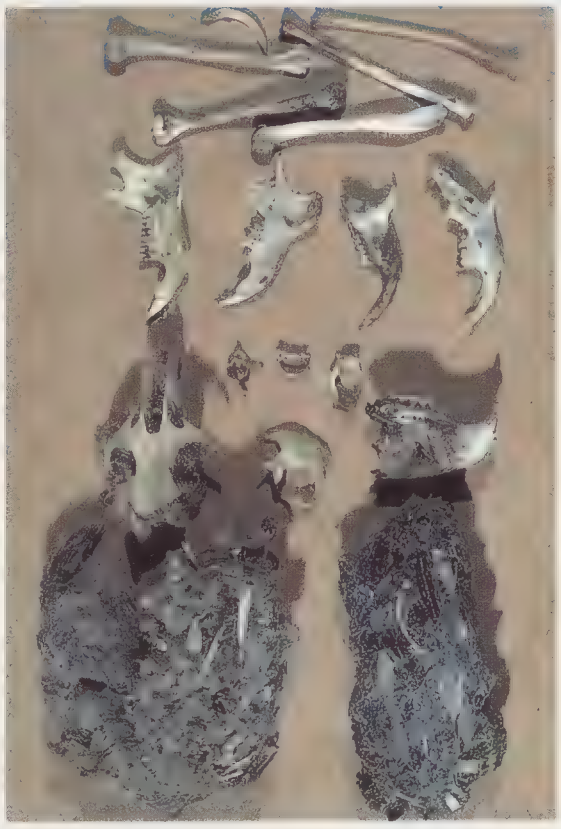
They are trying to determine the minimum amount of old-growth forest that must be retained if the owl population is to stay healthy. In a somber beginning, resource managers recently developed a management plan for spotted owls in southern Washington. Then Mount St. Helens erupted, killing scores of spotted owls. Had the plan been in place, the gamble for southern Washington would have been lost. Such unexpected events, including catastrophic wildfire and disease, are among the hazards of maintaining only a minimum amount of forest.

Although the spotted owls' future is in jeopardy, Dr. Lande's prediction of imminent extinction may be premature. However, a critical question remains unanswered—how healthy is the present population? While several thousand owls sounds like a lot, the population could be no more than a remnant of what it once was, considering the millions of acres of old forests that have been cut over the past century. What effect has this fragmentation had on the health of spotted owl populations?

C. ALLAN MORGAN

WAYNE LANKINEN/DRK PHOTO

WAYNE LANKINEN



MARTY CORDANO

The nocturnal spotted owl regurgitates pellets which can be dissected to show indigestible fur and bones of a variety of small mammal prey, including the northern flying squirrel.

Studies by R. J. Gutiérrez in California, and Charles Meslow and Gary Miller in Oregon have examined survival of juvenile spotted owls which have left their parents' care. By attaching radio transmitters to the owlets, the researchers were able to follow the young birds in their quest for their own territories. Survival through the first year of life is low in all bird species, but in spotted owls it seemed especially low. In some years none of the radio-equipped owls survived their first winter; in other years less than 10 percent survived. Next to starvation, the most common cause of mortality was predation from great horned owls, a species that does well in forests fragmented by logging.

Many biologists have noted that spotted owls don't breed every year or even every other year. In my research I found some owl pairs bred consistently year after year; other owls bred only once in seven years. In 1985, as in most years, some spotted owls within my northern California study area bred successfully, many did not. One pair produced their first young in four years. I felt like passing out cigars when I saw the two fuzzy, gnomelike hatchlings.

High juvenile mortality and low breeding success may be symptoms of the spotted owls' decline. Careful consideration of the breeding status and history of each spotted owl pair should be part of the management planning process. If, as resource managers decide which owls will receive protection and which won't, they select birds which rarely breed, the success of the owl population would be doubtful. Several biologists have noted that spotted owls living at high elevation are poor breeders. Unfortunately, since high elevations harbor lower grade timber, these owls are the easiest to protect.

Those who argue for protection of old-growth forests and spotted owls have their work cut out for them. On one side, lumber interests want to cut as much valuable old timber as they can. On the other side, conservationists want to protect as many owls as possible. Understandably, economic concerns will receive their due hearing. However, at issue is not just an owl, but all organisms of the old-growth forests. The continued presence of spotted owls in these woods is one measure of a healthy community. □

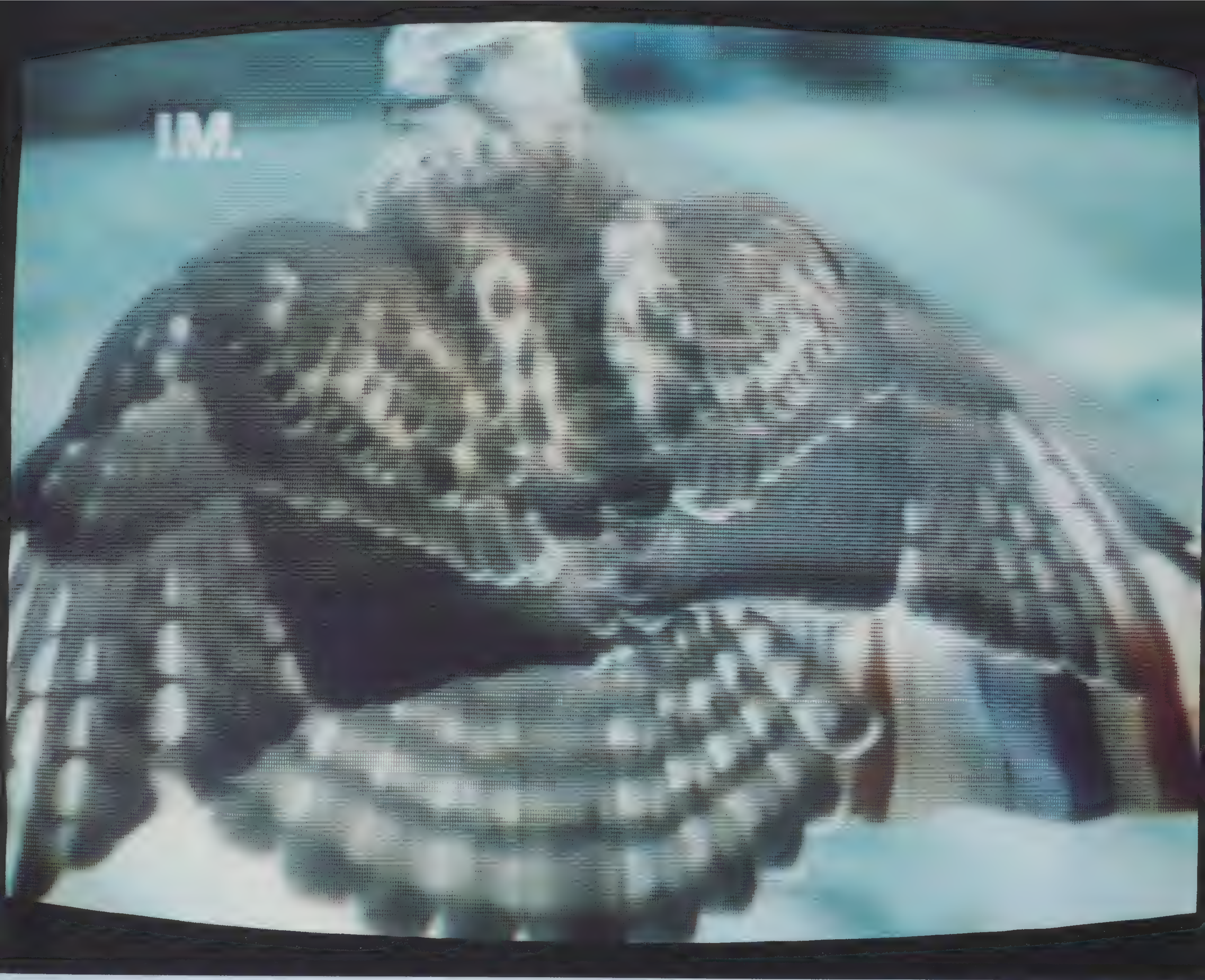
Cameron Barrows is a preserve manager at the Northern California Coast Range Preserve of The Nature Conservancy in Branscomb.

Further Reading

Barrows, C. "Cool Owls of the Old Forests." *Pacific Discovery.* April, 1985.

Barrows, C. "Roost Selection by Spotted Owls: An Adaptation to Heat Stress." *The Condor,* vol. 83, pp. 302–309 (1981).

Forsman, Eric D., E. Charles Meslow and Howard M. Wight. "Distribution and Biology of the Spotted Owl in Oregon." *Wildlife Monographs* No. 87 (1984).



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THE STRANGE HEART

JILL CRANE

. . . The tale telleth that my mother Leda flew
Zeus, who had stoln the likeness of a swan,
And, fleeing from a chasing eagle, wrought
By guile his pleasure,—if the tale be true.
—from the play *Helen* by Euripides, Athens, 412 B.C.

TRUE or not, the Greek myth of Leda and the swan caught the imaginations of artists and authors of international rank throughout the centuries. During the 16th century, for example, Italian artists Leonardo da Vinci and Paolo Veronese produced paintings based on what may be the best known swan myth. Around 1816 French artist Théodore Géricault again portrayed the scene (right).

The story holds that on a warm summer day in Sparta the beautiful Leda bathed on the banks of the Eurotas River. While being pursued by an eagle, the mighty Zeus, supreme god of the Greek pantheon, spied her and dropped down for a closer look. As soon as he touched the water he transformed himself into a majestic swan. In this disguise he achieved his amorous purpose, and nine months later Leda laid one, perhaps two, enormous eggs out of which emerged Clytemnestra and Helen (of Troy fame), and Castor and Pollux, who Zeus later turned into the constellation Gemini.

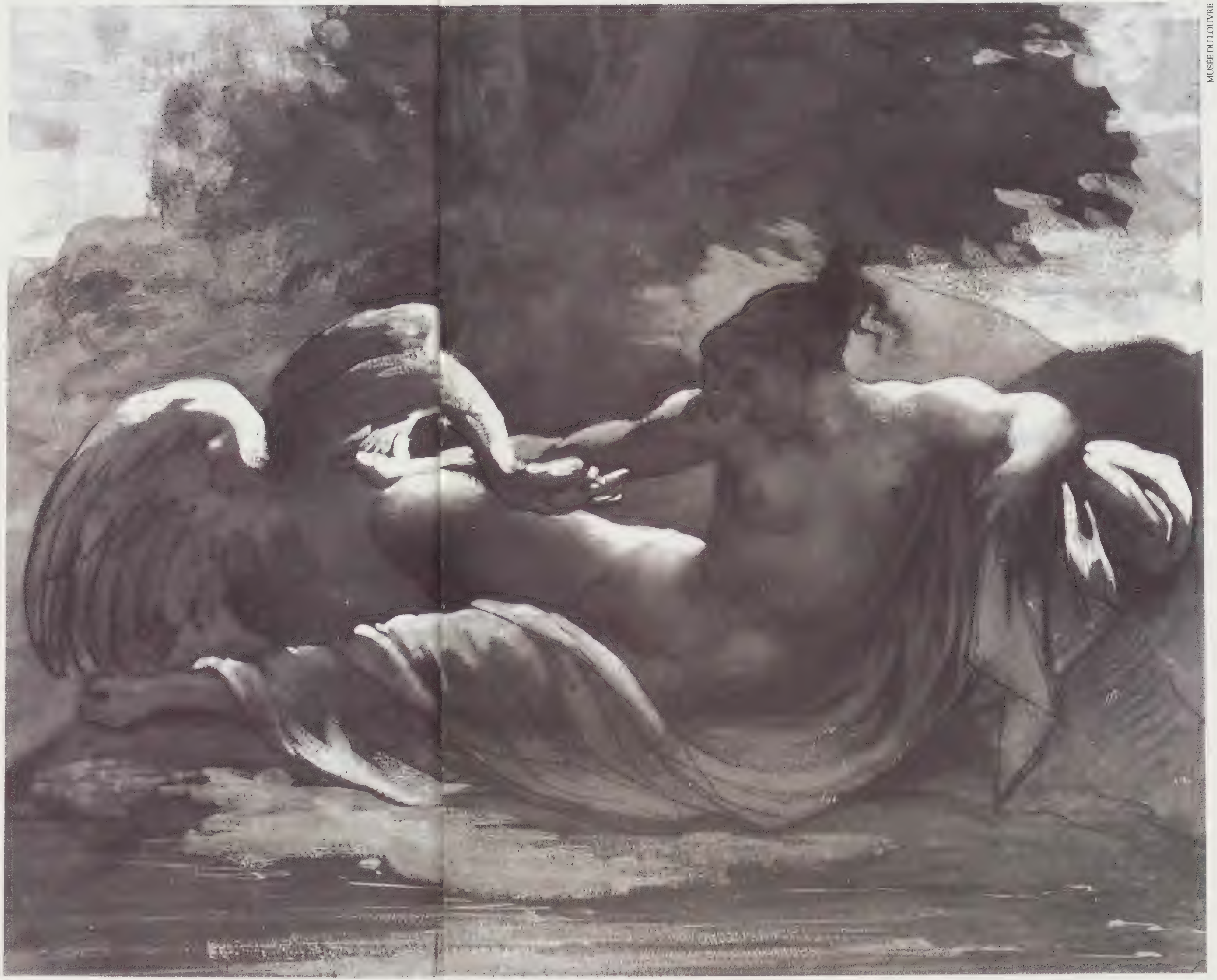
In 1923 Irish poet William Butler Yeats used the Greek myth as the theme for his famous poem *Leda and the Swan.*

A sudden blow: the great wings beating still
Above the staggering girl, her thighs caressed
By the dark webs, her nape caught in his bill,
He holds her helpless breast upon his breast.

How can those terrified vague fingers push
The feathered glory from her loosening thighs?
And how can body, laid in that white rush,
But feel the strange heart beating where it lies?

A shudder in the loins engenders there
The broken wall, the burning roof and tower
And Agamemnon dead.
                    Being so caught up,
So mastered by the brute blood of the air,
Did she put on his knowledge with his power
Before the indifferent beak could let her drop?

From *Collected Poems of W. B. Yeats,* The MacMillan Company, New York. 1960. With permission Anne Yeats and Michael Yeats.



MUSÉE DU LOUVRE

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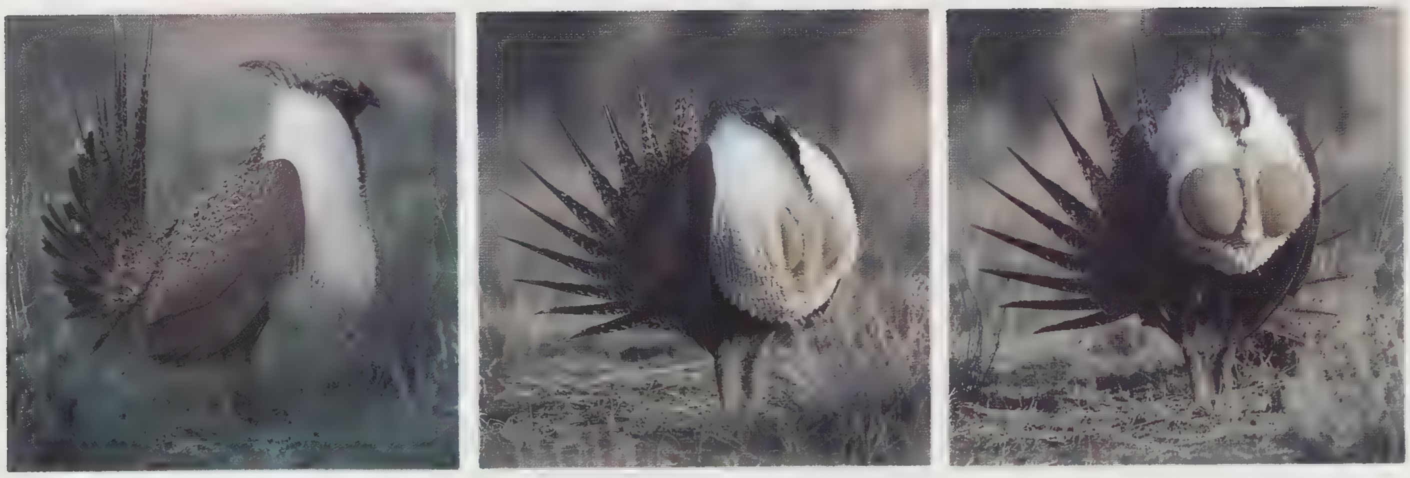


JEFF FOOTT (3)

Behavior-watching can turn an ordinary bird walk into an adventure as you attempt to understand the language of birds. Left, a male ruffed grouse drums to attract a female; above, sage grouse engages in courtship display.

On the Behavior Watch

DONALD AND LILLIAN STOKES

IMAGINE that you could understand the language of birds—that by seeing two male red-winged blackbirds perched together with their bills pointing up, you know they are competing over a territorial border. That by seeing a male and female mallard floating close to each other, bobbing their heads, you know they soon will mate. That by hearing a drawn out, rasping call in a nearby field, you know a male and female northern mockingbird are in the early stages of courtship. That by hearing a short version of a mourning dove's coo, you know the bird's nest will be nearby.

But you don't need to imagine what this would be like. You can interpret the behavior of birds. You don't need any fancy equipment, expert identification skills, or hours of watching in cramped positions. All you need is a moment of time, some curiosity, and information to help you understand what you see and hear.

We call this activity behavior-watching and once you start, we think you'll find it challenging, addictive and fun. It can transform a bird walk where you see only a few common species into a world of discovery as you become involved in the interactions among birds and begin to follow the lives of individuals.

The two most important ingredients of behavior-watching are time and curiosity. The time can be as brief as a minute or two and the curiosity as simple as the question "What is this bird doing and why?" If even a fraction of the time that is spent identifying birds in the field was spent on watching their behavior, we would know much more about birds' lives.

To help you get started we would like to offer several tips which we hope will increase your enjoyment of behavior-watching. One is to use binoculars so you can get close to birds without disturbing their normal behavior patterns. Another is to follow one bird for at least a couple of minutes, trying to avoid distractions posed by other birds. This involves anticipating the movement of the bird, keeping it in view, and moving quickly to stay with it. It helps if you pick an open area where you can see for long distances and move about easily.

Another tip is to listen for all the sounds, or auditory displays, a bird makes. Try to remember them and distinguish among them. This can be done by jotting down a description of the call, noting if it is high or low, repeated or single, melodious or harsh, fast or slow. You also may want to write a word that sounds like the call, such as "ank, ank" or "werwerwerwer." Through this you can begin to learn the repertoire of a given species.

This is important since each sound probably has a different function. Distinguishing among calls and watching the actions that occur when they are given is your start toward learning their function or meaning for the bird. After hearing the same call many times in similar circumstances you will associate it with the situation; ultimately, just by hearing the call, you may be able to guess what the bird is doing.

The same is true for visual displays—

JAN L. WASSINK (2)

unusual body or feather positions—or movements that may highlight a bird's markings, such as a male red-winged blackbird exposing its red epaulets, a common grackle ruffling the iridescent feathers around the neck, or a rufous-sided towhee spreading and exposing the white spots on its tail.

While behavior-watching keep written notes. These will not only help you to remember what the bird did, you also may be seeing something nobody else has ever seen. An astounding feature of our understanding of birds is how little is known about the behavior of many common species. Behavior-watching is an area of science where an interested observer can add a great deal to our knowledge.

When describing behavior many people are subject to two common pitfalls. If you can avoid them, the results of your behavior-watching will be infinitely more valuable.

The first pitfall is calling a bird "he" or "she" before you know its sex. We have found that most people automatically call all birds he. This means that about half the time they are wrong. At other times they assume the bird is a she because it is sitting on a nest or feeding young. Knowing the sex of a bird can add useful information to your observations, for interactions are different depending on whether they are between a male and a female, two males, or two females. Therefore, use "it" when you're not sure of the bird's sex. Check your field guides to see if the sexes can be distinguished by plumage. If male and female have identical plumage, as in blue jays or titmice, then use our behavior guides for ways to distinguish the sexes through behavior.

The other pitfall is more subtle—it is mixing observations with assumptions. An observation is a description of what took place; an assumption is a conjecture as to why it took place.

Suppose two people see an interaction between gray catbirds. The first person describes it like this: "A male catbird was sitting on his territory and singing when another male intruded. The territorial bird saw the intruder and chased him, stopping once in a while to sing a more insistent song. The intruder was undaunted and kept flying around in circles."

The second person describes it like this: "One catbird was singing in a tree and another catbird approached. The singing bird chased the other bird, stopping every so often and giving a higher, quieter version of its song. The chased bird kept circling in a small area."

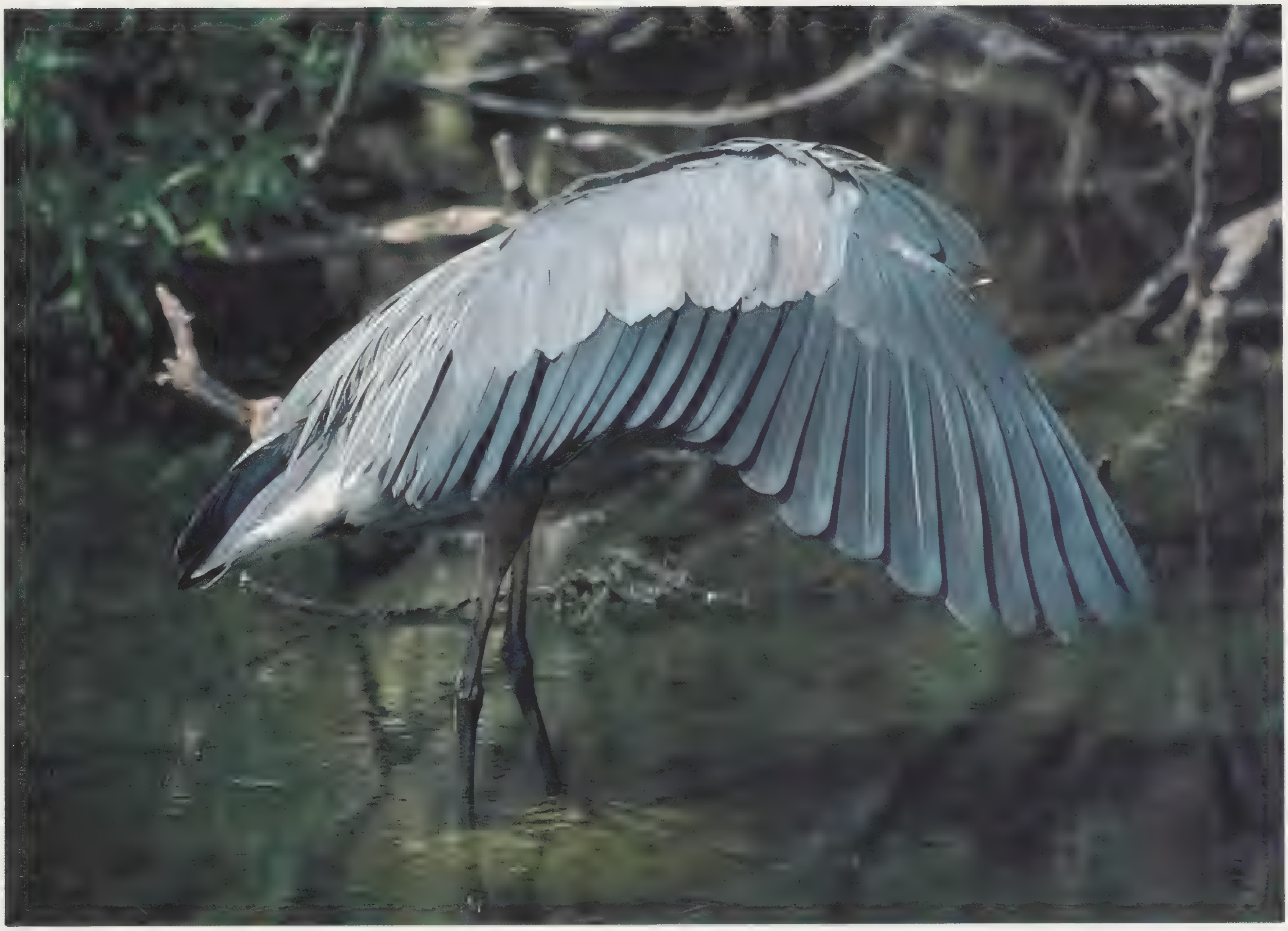
The first person gave a description in which assumptions are stated as if they were facts. The statement assumes both birds are male, that the first bird was on its territory, that the second bird was an intruder, that the second version of the song was more insistent, and that one of the birds was undaunted.

The second person gave a factual description of what happened. From these facts we can suggest theories about what took place. Facts are like a clear spring

Surprisingly little is known about the behavior of common birds. We do know, however, that the Canada goose, left, is chasing an intruder; the red-winged blackbird, above, is exposing its epaulets to intimidate birds with smaller, less colorful ones, and the great-tailed grackle, below, is ruffling its feathers to look large and threatening.

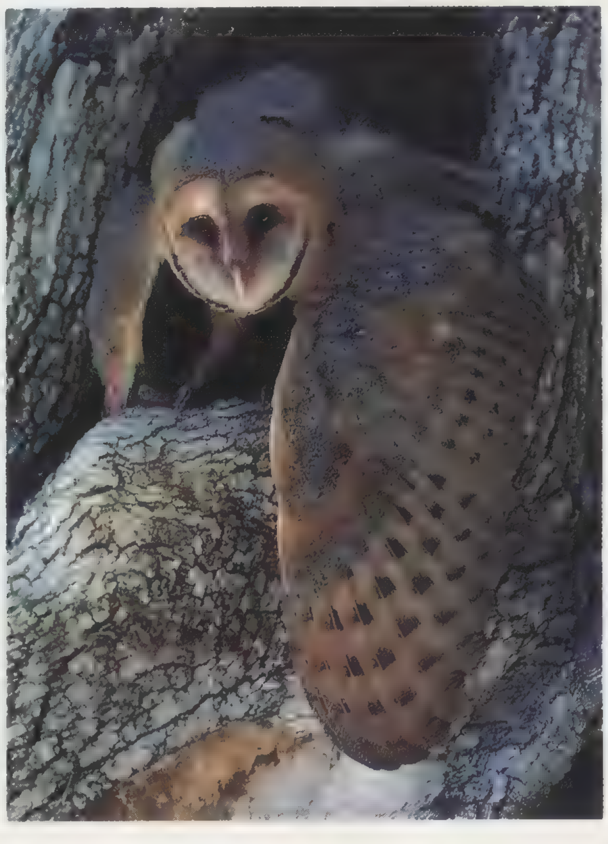
JOE & CAROL McDONALD

MARTY CORDANO/DRK PHOTO



The more carefully you look at birds, the more you'll want to know what they are doing. Barn owl, below, is defending its nest with a threat posture. Great blue heron above is fishing—the shadow created by its wings reduces glare on the water, enabling the bird to see its prey better. Roadrunner, right, is sunbathing.

JOHN HENDRICKSON



C. ALLAN MORGAN

from which endless buckets of assumptions can be drawn. Thus, there is nothing wrong with assumptions or theories, but they should remain distinct from facts.

Research has shown that what was happening between the catbirds was probably courtship. Male catbirds chase females when they enter the territory, and during the chase, males occasionally stop and sing a higher, softer version of their song. An intruding male catbird would flee from the territory when being chased by the resident male; the female remains on the territory, flying in short circles.

Once you have observed bird behavior you are going to want to know what it means. Here is where you will need help interpreting what you've seen. Most information on bird language and behavior comes from the work of ornithologists over the past 50 years. Their discoveries are in professional journals such as *The Auk*, *The Wilson Bulletin*, and *The Condor*, but wading through them can be a laborious process for the average behavior-watcher. That is why we wrote a series of books *A Guide to Bird Behavior*. The first two volumes organize and condense the most recent research on the language and behavior of 50 species of common birds, enabling you to interpret what you see and hear in the field.

Another source of information on bird behavior is a series of books compiled by Arthur Cleveland Bent between 1919 and 1968 called *Life Histories of North American Birds*, often referred to as the Bent series. Their advantage is that they treat most North American species; their disadvantage is that they do not include the voluminous material of the last 30 years and they are often anthropomorphic in their descriptions. Still, the Bent series is a good source of information.

Other books that contain information on behavior include: *A Guide to North American Waterfowl; Plovers, Sandpipers, and Snipes of the World,* and *North American Game Birds of Upland and Shoreline* by Paul Johnsgard; and *Crows of the World,* and *Pigeons and Doves of the World* by Derek Goodwin. These books include information on social behavior and lists of references. Other good books devoted to the life of a single species are available in libraries and bookstores.

One final tip before you go out to watch behavior: don't be in a hurry to answer why a particular behavior occurred. It is better not to rush in with assumptions that close your mind to a given behavior. Instead, leave the facts open and question them. In this way your questions will lead to more observations which in turn will produce more facts. All this eventually will bring you closer to understanding the nature of birds' lives. □

Donald and Lillian Stokes are authors of the Stokes nature guides which include *A Guide to Bird Behavior, Vols. I and II.* Watch for the Stokeses' new series WATCHING beginning in the next issue of *The Living Bird Quarterly.*

RESEARCH & REVIEW

Richard E. Bonney, Jr.

SAFETY IN COLORS

For a checkerspot butterfly, it's dangerous to be female. And for males, it's hazardous to have too little red coloration on the wings. Both females and dully colored males are more likely to be attacked and eaten by birds, according to M. Deane Bowers, Irene L. Brown, and Darryl Wheye of Harvard and Stanford Universities ("Bird predation as a selective agent in a butterfly population," *Evolution*, vol. 39, pp. 93–103).

Bowers, Brown and Wheye studied predation on the checkerspot butterfly *(Euphydryas chalcedona)* at a Stanford University biological preserve near San Jose, California, where they discovered several hundred detached butterfly wings over a period of a few weeks. The wings showed beak marks and triangular tears, indicating that birds had attacked and removed the wings before eating the bodies.

Checkerspot butterflies differ greatly in appearance. This particular population had wings checkered with black, cream and variable amounts of red. Wings of females had little or no red, while males' wings ranged from somewhat red to very red.

By examining the detached wings and comparing them with wings collected in a random sampling of the local checkerspot butterfly population, Bowers, Brown and Wheye determined that birds had eaten more females than males. Furthermore, among males, birds had eaten those butterflies with the dullest wings. The researchers concluded from these observations that birds attack the least-red segment of the butterfly population.

Why do hunting birds avoid the reddest checkerspot butterflies? The researchers suggest two reasons. First, some studies have shown that red serves as a warning color, and that many birds routinely avoid brightly colored prey. Second, birds may select the least red butterflies because they are more likely to be females, which are more desirable since they are larger and more succulent than males.

If birds avoid the reddest checkerspot butterflies, then why hasn't the evolutionary process caused the population to become more red? Perhaps it has. Or maybe being dull has its advantages, for example, dull butterflies may retain heat better than brightly colored ones. Therefore, wing colors of checkerspot butterflies could represent a compromise between the risk of being eaten and the risk of being cold.

SAFETY IN NUMBERS

While walking through the winter woods, you may have noticed flocks of birds of several different species. In eastern North America, one of the most common mixed flocks consists of black-capped chickadees, tufted titmice, white-breasted nuthatches, and hairy and downy woodpeckers. Why do these birds flock together?

Ornithologists have proposed several reasons, two of which involve avoiding predation and finding food. First, flocking may protect against predation because approaching predators are more likely to be detected by birds in a group than by solitary birds. Second, flocking birds may eat better than solitary birds because individuals in flocks can spend less time watching for predators and more time searching for food. A recent study by Kimberly A. Sullivan of Rutgers University provides support for both ideas ("The advantages of social foraging in downy woodpeckers," *Animal Behaviour*, vol. 32, pp. 16–22).

Sullivan conducted her study during two winters at the Great Swamp National Wildlife Refuge in New Jersey, where she observed the behavior of 20 individually marked downy woodpeckers. The birds spent most of their time foraging, either alone, in mixed flocks, or in the company of one or two flock members.

While foraging, the birds occasionally cocked their heads and looked from side to side. Sullivan believes this behavior is in response to danger because they cocked their heads far more often when in the presence of potential predators than when not. But not all birds were equally vigilant; downy woodpeckers foraging alone cocked their heads about 20 times per minute. Those feeding with one or two flock members cocked their heads about 13 times per minute, and those in flocks of three or more birds cocked their heads only about six times per minute.

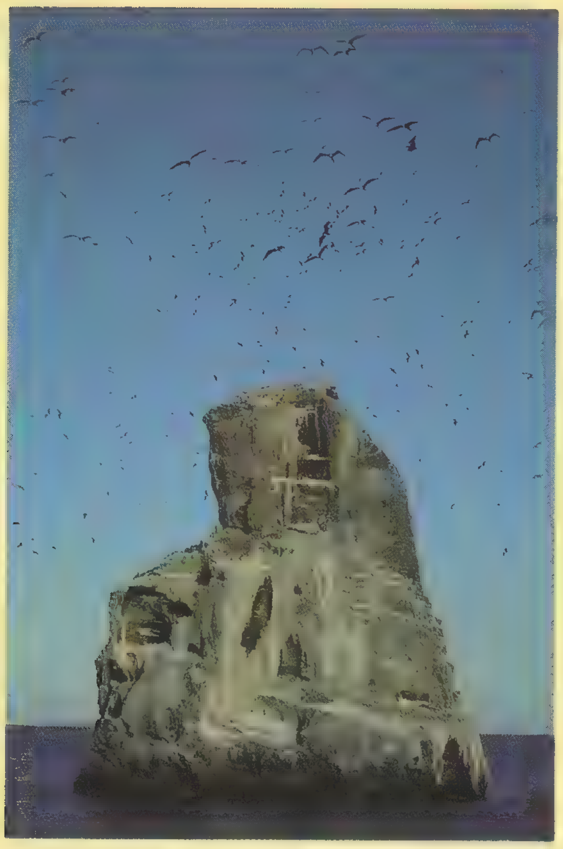
Sullivan also found that the least vigilant birds—those in flocks—captured nearly three times as many food items per minute than birds feeding alone. She concludes that one reason downy woodpeckers may join flocks in winter is to take advantage of their flockmates' extra eyes and ears.

Why join mixed-species flocks instead of flocks composed only of downy woodpeckers? In addition to avoiding predators and having more time to search for food, Sullivan speculates that birds feeding in mixed flocks may avoid competing for food since different species generally eat different types of food or forage in different locations.

BOOK REVIEWS: Ocean Birds

Birds of the ocean can be very hard to see. While a few ocean birds such as gulls and terns are found near shore all year, many others, such as albatrosses, storm-petrels and jaegers, spend most of their lives over the open ocean, visiting land only to breed. And even then these birds are usually far from the sight of most bird watchers—perhaps on remote, rocky islands, or on the frozen arctic tundra.

Nevertheless, a surprising amount is known about the lives of many seabirds. Ornithologists and bird watchers from all over the world have spent countless hours observing them from the decks of lurching ships and studying their behavior on often inhospitable breeding grounds. Much of the knowledge of



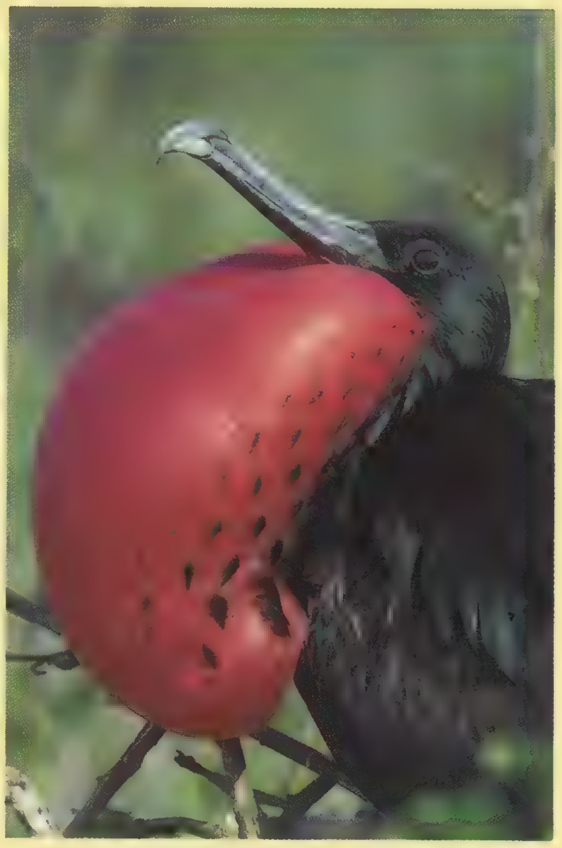
C. ALLAN MORGAN

ocean-dwelling birds has been included in two recently published books: *Seabirds of Eastern North Pacific and Arctic Waters* edited by Delphine Haley. 1984. Pacific Search Press, Seattle, Washington. 214 pages. $39.95 (cloth) and *Ocean Birds* by Lars Löfgren. 1984. Alfred A. Knopf, New York. 240 pages. $27.50 (cloth).

Seabirds is an attractive and well-written book that should appeal to anyone interested in ocean birds, from novice to professional ornithologist. The bulk of the book comprises accounts of the more than 100 seabirds found in the vast region from the Bering Sea and the Gulf of Alaska south to the Hawaiian Islands and Baja California, one of the Earth's most fertile feeding grounds. The accounts were written by 13 authors—mostly professional ornithologists with first-hand knowledge of their subjects—and are easy to read but not watered down. They discuss seabird distribution, breeding biology, feeding behavior and movement patterns, and contain some information not published elsewhere.

Editor Haley has done an excellent job maintaining consistency of style and format from author to author, and also has provided two excellent introductory chapters that discuss the marine environment, seabird groups, interactions between seabirds and humans, and general seabird biology. The book also includes numerous beautiful color photos, detailed range maps which show the distribution and major breeding areas of each species, and several line drawings which illustrate various behaviors. It is too bad this excellent book does not cover a wider geographic range.

Ocean Birds also is a fine book, but less suited to a general audience. It is not difficult to read, but is quite detailed, and includes a great deal of technical information on evolution, speciation, classification, physiology, migration, ecology, behavior, and reproduction. Because the book describes the world's seabird groups in one chapter, accounts are given only by genus and are very short. The book is well illustrated with color photographs and drawings, black-and-white drawings, maps, graphs and charts, and will appeal primarily to ornithology students and birders with a serious interest in birds of the oceans.



FRANS LANTING

Magnificent frigatebirds (left and above) are discussed in two new books about seabirds.

FIGHTING FOR FRUIT

The mistle thrush, a European relative of the American robin, is a fruit-eating bird with an unusual behavior. Unlike nearly all other fruit-eating birds, mistle thrushes defend their food throughout most of the winter.

This little-known fact was recently documented by Barbara K. Snow and D. W. Snow of the Zoological Museum, Hertfordshire, England, who studied mistle thrushes during three consecutive winters in the Hertfordshire area ("Long-term defence of fruit by Mistle Thrushes *Turdus viscivorus*," *Ibis*, vol. 126, pp. 39–49).

The Snows found that in October and November, after fruits began to ripen, mistle thrushes chose a fruit-laden plant or clump of plants—usually holly or mistletoe—and began defending it by attacking intruders and driving them away. Defense was selective: other fruit-eating birds which approached the plant were driven away quickly, while species that seldom eat fruits, such as blue tits, were allowed to remain in the vicinity. However, mistle thrushes avoided eating the defended berries until late winter. Instead, they fed mostly upon berries from other nearby sources, saving the defended fruits until other berries were exhausted. In this way the thrushes provided themselves with a constant food source throughout the lean winter months.

Why don't more birds defend winter fruits? Two reasons are likely. First, only fruits which remain edible for many months after ripening and grow on a discrete plant or clump of plants are worth defending, and few of these exist. Second, only large and aggressive birds, such as the mistle thrush, can intimidate other birds and afford the energy to do so. The only American species known to defend fruit, the northern mockingbird, also is large and aggressive.

NEWS & NOTES

Compiled by Steven C. Sibley

LABORATORY SUMMER COURSES

Join us in June for two exciting Laboratory-sponsored field courses. Our classroom will be Cornell's 4,000-acre Arnot Forest near Ithaca, New York, summer home for nearly 80 species of birds including ravens, red-shouldered hawks and barred owls.

Field Ornithology, offered June 1–7, 1986. Coordinated by Charles R. Smith, the Laboratory's director of Education and Information Services, field ornithology will hone your skills of bird observation and identification through the integration of field marks, song, and habitat cues. Lectures and discussions led by Laboratory staff will emphasize principles of animal behavior and ecology which can be applied to bird study anywhere in the world.

Nature Photography, offered June 8–14. Course coordinator and principal instructor will be Lang Elliott, manager of the Laboratory's home study course in bird photography. Noted natural history photographer Tim Fitzharris, whose photographs regularly adorn *The Living Bird Quarterly,* will be guest instructor for two days during the course. Many aspects of natural history photography will be discussed, from photographing birds at nests to taking close-ups of flowers and insects. Students will be encouraged to complete various photographic assignments, and the results will be viewed and critiqued during evening sessions.

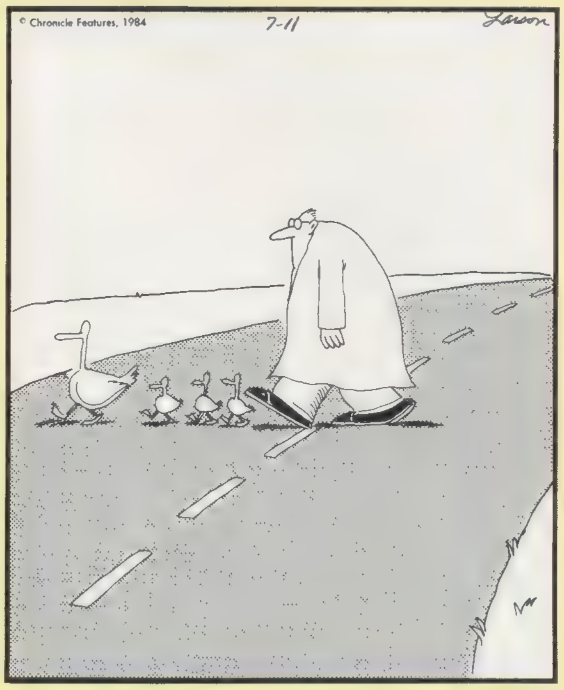
Each course is $325, which includes all food, lodging, class materials, and instruction fees from Sunday evening through Saturday morning. Course enrollment is limited with spaces available on a first-come, first-served basis. See insert in this issue for information about course fees, registration, and enrollment application.

THE SECTION OF Ecology and Systematics at Cornell University will offer a summer ornithology course between June 30 and August 12, 1986. The course is open to the public and no prior coursework in biology is required. All areas of avian biology will be discussed including anatomy, physiology, behavior and ecology. Laboratory and field sessions will cover field and identification techniques, morphology, molts and plumages, nests and eggs, and social behavior. There will be three lectures and one field trip or laboratory each week, depending on the weather. Also one weekend field trip is planned. The course yields four university credits; tuition and fees total $945 (housing not included).

The instructor will be David Winkler, an ornithologist with a variety of research experience in North America and Europe. For further information, contact Dr. Winkler at the Section of Ecology and Systematics, Corson Hall, Cornell University, Ithaca, New York 14853.

NATIONAL WILDLIFE Federation (NWF) won a lawsuit in August filed against the U.S. Fish and Wildlife Service (USFWS) and the Department of the Interior prohibiting waterfowl hunting during the 1985–86 season in 22 counties of five states, unless the states require the use of nontoxic (steel) shot in those areas. The ruling is designed to protect bald eagles from lead poisoning. NWF research showed that 89 bald eagles died of lead poisoning in the U.S. between 1966 and 1984. The eagles ingest lead when they eat ducks and geese that have swallowed spent lead shot pellets while consuming seeds and grit.

THE FAR SIDE By GARY LARSON



When imprinting studies go awry

Reprinted by permission of Chronicle Features, San Francisco

With approval of each state, USFWS had already established nontoxic shot zones in eight counties in Iowa, Kansas and South Dakota to protect bald eagles, and in portions of 30 states, to lessen lead poisoning in waterfowl. USFWS had proposed nontoxic shot zones in the 22 counties in California, Oregon, Illinois, Missouri and Oklahoma but, by law, required each state's approval to establish the zones. USFWS was going to close the counties to all hunting during the 1986–87 season had the states not approved the zones, but NWF officials "considered the threat to eagles so grave that immediate and substantial action was needed." Following the lawsuit, all five states approved the nontoxic shot zones.

SEEING FEWER DUCKS this winter? U.S. Fish and Wildlife Service surveys showed duck numbers down to their lowest level since surveys began 30 years ago. An estimated 62-million ducks, 22 percent fewer than in 1984, headed south last fall. All duck species, except green-winged teal, were down in numbers although geese and swans fared better, with numbers generally the same as last year. Shortened hunting seasons and reduced bag limits were established last fall in the hopes of restoring duck breeding populations. Drought and loss of wetland habitat over the past few years, especially in midcontinent states and provinces, are blamed for the decline.

ELEVEN ENDANGERED Kirtland's warblers were found on their wintering grounds in the Caribbean last winter. Surveys conducted by the U.S. Fish and Wildlife Service to determine the warbler's status and winter range located five in the Bahamas, five in the Turks and Caicos, and one in Hispaniola. Travelers to these or other Caribbean islands are urged to watch for Kirtland's warblers in dry, desertlike habitats. Report sightings to Craig Faanes, USFWS, School of Forest Resources, University of Georgia, Athens, Georgia 30602.

LETTERS

Too Close for Comfort

I am disturbed by one of the winning photographs in your photo contest published in the summer 1985 issue of *The Living Bird Quarterly:* the three immature red-tailed hawks on the nest. The photographer stated that the picture was taken with a 50mm lens which means that he must have been very close to the birds.

Getting too close to young birds can be distressing to them and may even cause them to abandon their nest. It would have been far better to photograph these birds with a blind and a telephoto lens. Photographers should take every precaution to ensure the safety of their subjects. I urge you and the judges to consider carefully the ethics of photographs entered in future contests.

Carol R. Speegle
San Francisco

Loon Gloom

I read with great interest the article, "Trouble with Loons" by Laurence L. Alexander in the spring 1985 issue of *The Living Bird Quarterly.* What made it doubly interesting was that I had just returned from a visit to Kiawah Island, near Charleston, South Carolina where I had witnessed the largest migration of common loons I have seen in more than 55 years of intensive birding.

On March 7, 1985 I was birding at the south end of Kiawah Island. Between 7 and 10 a.m. we watched a tremendous movement of loons moving in a northerly direction along the coast. At least 4,500 loons passed our observation point and were still going by when we left. One of my companions said that he had witnessed a similar flight in late December 1984 while doing the McClellanville, South Carolina Christmas bird count.

Alexander's article indicated that common loon numbers were significantly depressed in the winters of 1984 and 1985 near his home on the northern Gulf Coast of Florida where a massive loon die-off occurred in the winter of 1983. Our observations indicate that there may be a large common loon wintering population off the southeast Atlantic coast which is not affected by the intestinal parasite and mercury contamination apparently prevalent in northern Gulf Coast waters.

Jackson M. Abbott
Member, Board of Directors
Virginia Society of Ornithology

Editors' reply:

While your observations are encouraging, counts made during migration are of limited use in determining the true health of bird populations. Like all migratory birds, common loons prefer to migrate under specific wind and weather conditions. Your observation may reflect a concentrated movement due to favorable weather rather than a healthy loon population. For example, a clear March day with southerly winds following many days of northerly winds will spur loons along the southern Atlantic coast to migrate northward. The only way to be certain whether more loons passed Kiawah Island this past year would be to compare counts from a single observation post from February through April with counts taken from the same place over the past several years. And even that would provide only the roughest measure of abundance.

The best way to measure bird populations accurately is to conduct censuses on the breeding or wintering grounds. Laurence Alexander has also alerted us of the possibility that all loons may be carrying sublethal accumulations of mercury, making the health of these migrating loons questionable.

Dear Member:

When Bill Keeton founded the Cornell pigeon project to unravel the mystery of bird navigation years ago, one of his central ideas was to have a large operation—many pigeons, many people and lots of visiting investigators. In this way there could be many experiments and the broadest possible discussion of their results. Since Bill's death in 1980 I've tried to continue this tradition. With help from Irene Brown, Tony Lednor, Jerry Waldvogel and a host of students and assistants, we have kept as many as 1,500 pigeons at the lofts on Turkey Hill here in Ithaca and have played host to researchers from all over the world.

Last summer, for instance, guests from Canada, Germany, Italy, and the United States gathered for a day-long discussion at the Lab. While no solution to the question of how pigeons find their way home came out of our talks, one interesting possibility emerged. Floriano Papi and his colleagues in Italy have found that olfactory information plays a critical role in pigeon navigation. Pigeons that cannot smell neither orient nor home. But at Cornell such pigeons do home, although less accurately, while some German pigeons seem totally unaffected by olfactory deprivation. Pigeons from my old loft in Lincoln, Massachusetts released where the Earth's magnetic field is disturbed are disoriented. Yet pigeons from the Cornell lofts released at the same places orient and home without difficulty.

These results give rise to speculation: could pigeons from different genetic stocks, reared in different environments, favor different cues for navigation? It is an attractive idea—if true it would explain the varying results of the investigations in different countries.

If it were true for pigeons, could it be true for migratory birds as well? We hope to find out. If this idea turns out to be correct, it will be a tribute to Bill Keeton's vision and ability to provide a place for collaborative experiments and the free exchange of views.

CHARLES WALCOTT, Executive Director

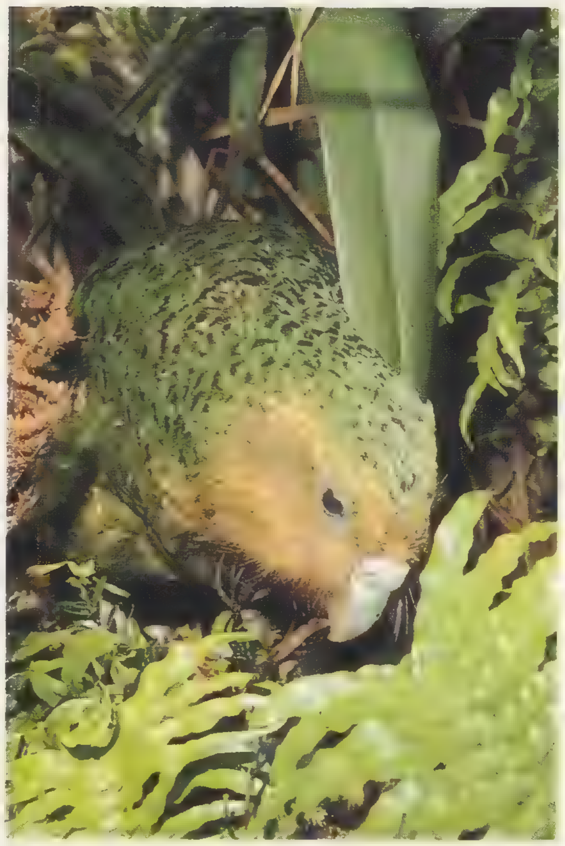
Spotlight on the Kakapo

MARK J. RAUZON

Is the parrot that booms a creation of Lewis Carroll's imagination? Hardly. It's a kakapo—a nocturnal, flightless owllike parrot that is very real and very endangered. As few as 50 remain in the wilderness of New Zealand, and if plans of the New Zealand Wildlife Service are not successful, the species could pass into oblivion.

To understand why the kakapo is endangered, one must look to the biogeographic history of Australasia. About 80-million years ago, New Zealand split off from the Australian landmass. Isolated in the vast South Pacific, the newly formed islands were inaccessible to terrestrial mammals. Without predators, the flightless native birds, such as moas, kiwis, rails, and kakapos, foraged unmolested until the arrival of the Maori around 900 A.D. The colonization of New Zealand forever changed the environment. Grasslands and forests were torched to provide agricultural lands. Predatory rats and dogs were brought to the islands on boats, and the flightless birds were hunted for food and feathers.

By 1769, when Captain Cook arrived in New Zealand, the kakapo was already limited to isolated populations on North and South Islands. Europeans accelerated the demise of the kakapo and other birds by introducing over 200 species of animals, 76 of which became established. In the 1880s, the death knell was sounded. Mustelids (weasels, stoats and ferrets) were released to control rampaging European rabbits. In addition to hunting rabbits, the mustelids eradicated North Island kakapos and invaded their last strongholds in the mountains of Fiordland on South Island.



G. J. H. MOON/F. L. (BRUCE COLEMAN, INC.)

A parrot that booms
by the light of the moon
An owl that eats grass
and cries like a loon
A flightless green what-not
that waddles around,
Luffing and loafing
in a hole underground.

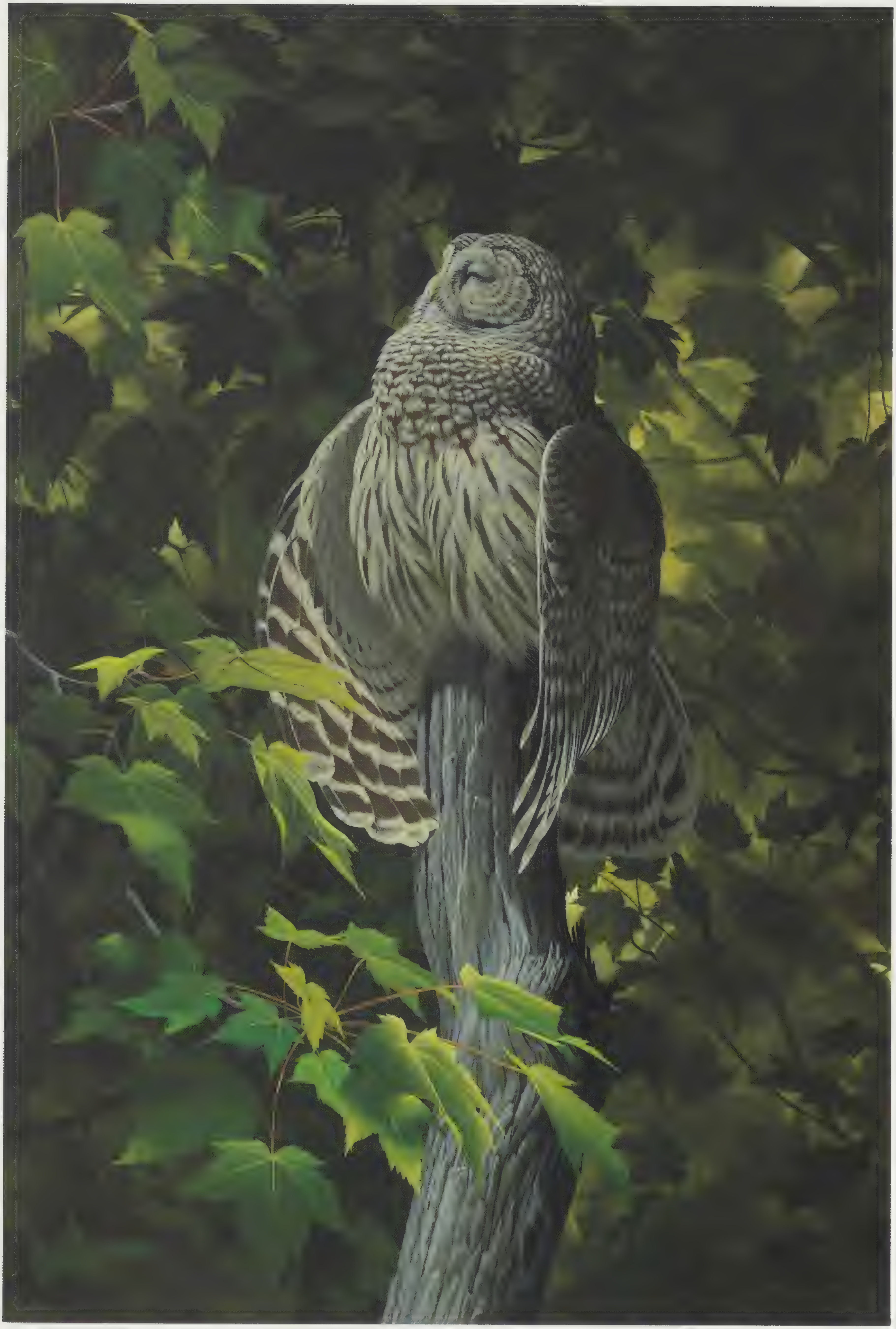
By 1975, only 15 male kakapos could be found. An attempt to establish four kakapos on Maud Island was frustrated when mustelids swam there from the mainland. The future looked bleak until 1977 when a population of 40 kakapos was discovered in the remote bush country of southeast Stewart Island. With the aid of muzzled hunting dogs, the first female kakapo seen this century was located there in 1980. Optimism dimmed when New Zealand Wildlife Service and World Wildlife Fund biologists discovered the remains of kakapos in fecal pellets of feral cats. Survival of the species could be guaranteed only in a predator-free environment.

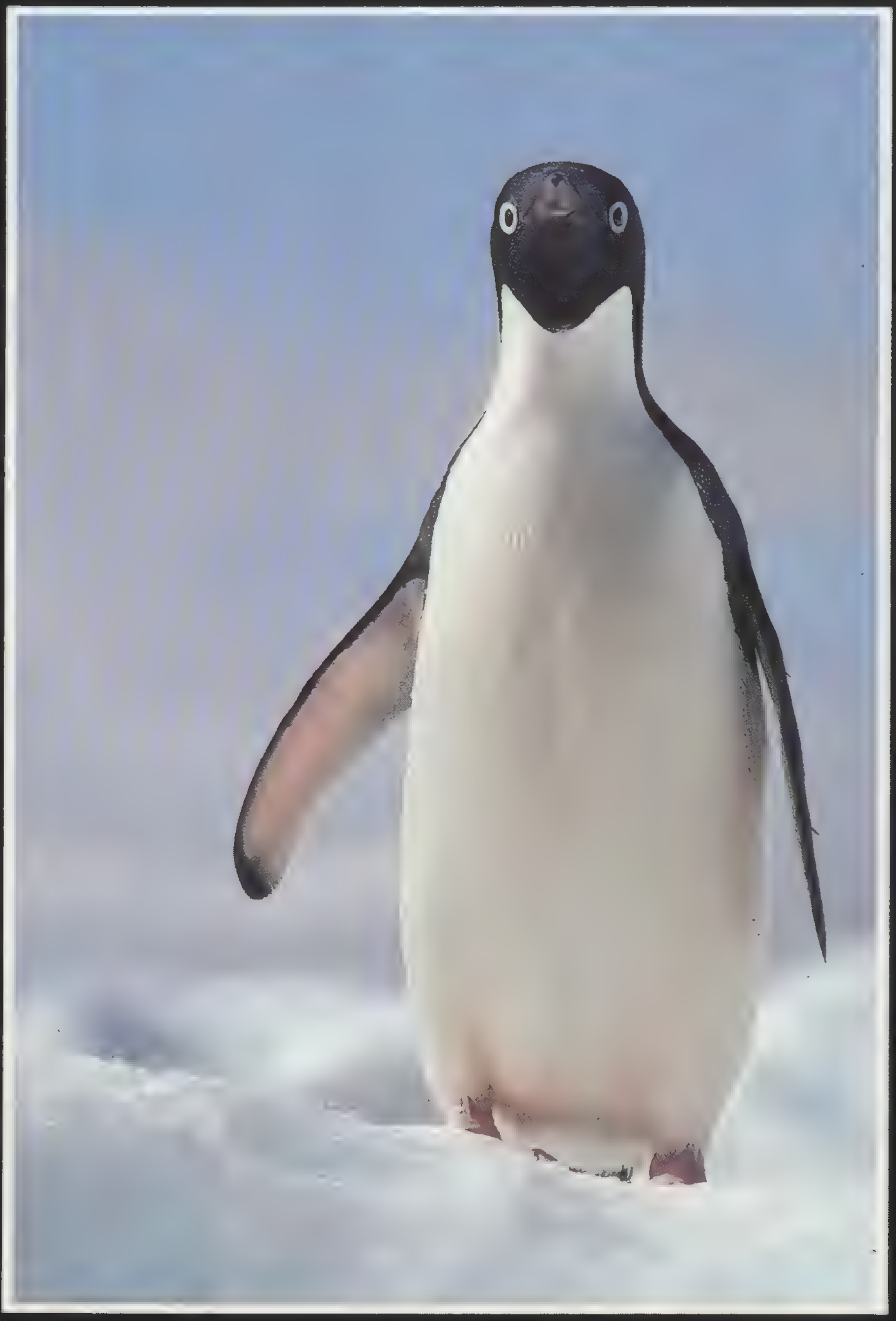
But where? One place fit the requirements: Little Barrier Island. The island had been spared most Maori burnings and European logging in spite of its proximity to Auckland, New Zealand's largest city. However, one problem stood in the way of its becoming a sanctuary for the dwindling kakapo—a large population of feral cats. But through the ceaseless efforts of Richard Veitch and the New Zealand Wildlife Service, the cats were removed. Over 120 people labored 4,000 hours between 1976 and 1980 in steep, dense terrain to eliminate the cats. Once free of predators, endangered populations of stitchbirds and black petrels began to flourish on this modern-day ark. The hope of Richard Veitch was that the kakapo would do the same.

In 1982, 24 of the 40 kakapos on Stewart Island were transported to the rocky shores of Little Barrier Island for release into the more friendly environment. To monitor the health of the new colonists, each bird was weighed, measured and fitted with a radio transmitter harnessed over the short wings.

It is now nesting season on Little Barrier Island. Wildlife researchers following the kakapo hope to hear the male's grouselike "booming" from the mating leks. They also hope the females will reach breeding condition and will start laying one or two eggs every two to four years. It is a slow process, but the long-lived kakapo may at least begin to recover its numbers. With help from the New Zealand Wildlife Service, the kakapo may be rescued from extinction. □

Mark J. Rauzon is a marine ornithologist whose research interests deal with the effects and eradication of feral animals from islands.





THE LIVING BIRD

Quarterly

Spring 1986

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THE LIVING BIRD *Quarterly*

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Climbing mountains and wading across rivers, eating in the wind and sleeping in the dew, surveying more than 12,500 miles of Chinese wilderness, Dr. Liu Yinzeng pursues the rare white crested ibis.

p. 4 Hoopoe hopping

Front Cover: Outside–Anhinga preening in Everglades National Park, Florida. The anhinga is a large, fish-eating water bird also known as snakebird because it often swims with only its head and long, snakelike neck above water. Its feathers are not waterproof, so it must dry them by spreading its wings in the sun. Photograph by Arthur Morris/VIREO. Inside–Rainbow lorikeets. Stephen J. Krasemann/DRK Photo photographed these members of the parrot family in their native Australia.
Back Cover: Outside–Pygmy kingfisher. Photograph by E.P.I. Nancy Adams. Inside—On the Garden Wall: Chaffinch and Nasturtiums. ©1985 Robert Bateman.

JEAN-PAUL FERRERO (ARDEA PHOTOGRAPHICS)

TRAVELS WITH YOSSI

PETE DUNNE

THE door closed behind me with a muffled click. Instinct told me to wait until my eyes adjusted to the night before venturing outside my sleeping quarters. So I waited. The path that threads through the Har HaNegev Field Study Center was plain to see, but I kept to the shadows, moving like a hunted thing. Maybe a tawny owl could have crossed the grounds quietly enough to have gone unnoticed, but nothing that walks or crawls can move and not be heard in the stillness of the Negev Desert.

A dog barked. I stopped, not knowing how to respond. Then came another bark, this one more pointed, more demanding. It was answered by a long howl from the other side of camp, followed by a chorus of every yip, yap, yelp, and bark in the canid repertoire.

So much for not waking anybody.

I fled to my lookout point, pursued by a trail of barking dogs. One by one they lost interest and fell behind until only one Bedouin mongrel was still in tow. We walked to the edge of the escarpment overlooking the desert. The few scattered lights from the compound were far behind us, and the thread that attached me to civilization was broken. Below us was only the desert.

Thus began my last morning in Israel, the final day of an intensive, promotional tour organized by the Society for the Protection of Nature in Israel (SPNI) to acquaint representatives of key birding groups with a well-kept secret—the incredible bird migrations that pass through Israel. Our ranks were drawn from 14 countries and represented 31 ornithological, conservation, and birding organizations.

Israel's inhospitable and beautiful Negev Desert suffers only those creatures clever enough to mold their lives along the rim of existence.

Green crowns of vegetation could be seen on remote hilltops. The rest of the land is stark and cluttered with the debris of cast-off civilizations.

Leading the tour was Yossi Leshem, director of SPNI's Raptor Information Center, a tireless organizer and irrepressible defender of Israel's natural wealth. At his side, quietly and efficiently making sure that everything went according to schedule, was the director of the Eilat Bird Observatory, Edna Gorney. Together they had concocted an elaborate publicity scheme and persevered until they had convinced the Ministry of Tourism, the kibbutz system hierarchy, and El Al Airlines to foot the bill for the tour. Yossi and Edna mapped out an exhaustive five-week itinerary, compressed it into six days, sent out invitations, and prepared by sleeping 72 hours straight prior to our arrival in Tel Aviv on March 11, 1985.

We flew to Tel Aviv nonstop from New York on an El Al 747. You can thumb a copy of *Birds of Britain and Europe* only so long, so I pulled out the airline magazine to while away the hours. On the cover was a booted eagle, under it the legend: "The cover story, as a hearty welcome to participants in the Israel Bird Watching Seminar, is on the birds of Israel. . . . "

Yossi hadn't pulled any punches. The story, "Israel, a Haven for Birds and Bird Watchers," was written by Edna! I read avidly.

"The migration of millions of birds, resulting in their redistribution twice each year over the world's surface, is one of the most spectacular phenomena of nature.

"Israel stands out as one of the best places in the world to watch the migration of birds, especially birds of prey. Israel is one of the busiest aviation highways, as far as birds are concerned, and one of the reasons is the country's location between three continents: Europe and Asia to the north and Africa to the south. In addition to its own indigenous avian population, Africa serves as wintering grounds for an amazing number of birds. Some of these fly through Israel on their way to Africa in the autumn and back in the spring.

"The best place in Israel to watch bird migrations is Eilat, and the best time of year is spring. On peak days thousands of raptors are seen everywhere: over the densely built city and busy shopping centers, over the mountains to the west, over the hotels. They have a bird's eye view of tourists sunbathing around swimming pools as they cross the glittering blue Gulf of Eilat (Gulf of Aqaba), flying northeast into Jordan."

Edna went on to say that over 30 raptor species can be observed in Eilat each spring including the steppe eagle, steppe buzzard, Levant sparrowhawk, honey buzzard, black kite, and other harriers, falcons, and eagles.

I was so excited I couldn't sleep during the whole 18-hour flight. When we landed we were met at the airport by Yossi who ran interference as we struggled to extricate ourselves from baggage claim. The concept of a "line" is hazy in Israel. The popular interpretation seems to be that the shortest distance between you and the place you want to go lies directly in front of the person ahead of you.

Our bus was waiting out front. Birding commenced immediately, taking precedence over introductions between earlier arrivals and the American contingent. At first we saw only the everyday endemics of the region and the season—hooded crows, white wagtails, laughing doves, hoopoes, and common bulbuls, but an afternoon side trip to the harbor produced birds that turned heads everywhere—elegant slender-billed gulls, dainty little gulls, Arctic skuas, and a peregrine falcon cruising up the beach.

That night we were treated to a taste of Middle East hospitality. The congeniality of our hosts, bolstered by the free flow of ideas and liquid refreshments, prompted many to sacrifice a few hours of sleep for the sake of new friendships.

The next morning Yossi's wakeup call came at 6 a.m. Feigning wakefulness, we stumbled down to a hearty endemic breakfast of cheese, fruit, cheese, green peppers, cheese, yogurt, cheese, and several varieties of cheese. Then, making full use of his speed and organization, Yossi herded us onto our bus to begin our first day of tour. It ended 17 hours later at the Ramat-Rachel Guest House.

PETE DUNNE

Tristram's grackles whistle from the rooftops and sand partridges move among the shadows of the 10th-century Monastery of the Temptation.

Tel Aviv is a study in poured concrete and the city's birdlife is appropriately urban, mostly pigeons and house sparrows. Were it not for the bulbuls that fill the mockingbird's television antenna niche, the Coca Cola signs in Arabic, and notices in storefronts advertising price cuts for U.N. Forces, Tel Aviv could pass for any western city.

The road to Jerusalem is strewn with human history. Tooled stones lie everywhere. Where a tilled field lies today, a house or settlement stood before it. Green crowns of vegetation could be seen only on the remote hilltops. The rest of the land is stark and cluttered with the debris of cast-off civilizations.

I realized this land is not a desert solely because of the climate. It is this way because every square foot has been tilled, quarried, excavated, built upon, trod upon, or otherwise subjugated by the hand of man. The starkness of the landscape is not due to any stinginess of nature; it is caused by overpopulation and centuries of uninterrupted use.

In the afternoon we stood at the edge of the Judean Desert, which is nothingness folded into hills and hollows in order to give it substance. Then I saw the eagle.

It came up from beneath us, straight as a shaft of light. It perched on the arm of a crucifix erected by pilgrims. "A Bonelli's eagle," Yossi explained. "Its nest is below. Tell no one the location." Within the stern warning was an unmistakable undertone; this was one of the breeding raptors in Yossi's personal care.

Soon our eyes became skilled at seeing through the desert's disguise. There is life here. As we made our way toward the Monastery of the Temptation, we picked out desert larks, mourning wheatears, pale crag martins.

The monastery is all you want it to be: buildings cut deep into the face of the cliff, limestone steps worn and polished by countless worshiping feet. The only indication that this isn't the 10th century are the signs written in four languages that admonish: No Graffiti. Tristram's grackles wolf-whistled from the rooftops. Fan-tailed and

R. M. BLOOMFIELD (ARDEA PHOTOGRAPHICS)

Soon our eyes became skilled at seeing through the desert's disguise. There is life here.

Israel is an excellent place to watch birds because it lies in the migration corridor between Europe and Asia, and Africa. Israeli birds include the hoopoe (above) and Egyptian vulture (below), both migrants, and the Tristram's grackle, a year-round resident.

YOSSI ESHBOL/SPNI

JACK A. BAILEY (ARDEA PHOTOGRAPHICS)

M. P. KAHL (PHOTO RESEARCHERS, INC.)

The laughing dove or palm dove is commonly seen in Israeli towns, villages, and oases.

brown-necked ravens rode the heat waves overhead, a sand partridge moved among the shadows. Coursing back and forth were delicate lesser kestrels.

After a driving tour of Jerusalem, checking into the guest house, dinner, and a movie, survivors were treated to a comprehensive tour around the old walled city. At midnight Yossi finally relented and sent us to bed.

That night I don't think we slept at all. I know Yossi didn't. He was up long before sunrise, pounding on our door shouting "Ho Kay, everybody up, breakfast is ready."

Breakfast was a solemn affair, but we couldn't help admiring the superhuman antics of our host, bustling from table to table, stacking luggage, touching base with Edna and her clipboard.

This was not a day to miss. We clambered aboard desert vehicles and took a twisting road that led into the Judean Desert toward the cliffs of Ras-Nakeb-Hmar. The SPNI had established a hawkwatch point on the rim overlooking the Dead Sea.

Steppe buzzards, drawn aloft by the first thermals of the day, moved silently overhead. The local Barbary falcon, a pale, cut-down peregrine with a rufous nape, stooped at careless martins.

"Look, look," a dozen voices shouted in as many languages. Overhead, a flock of black storks caught the wind and continued north.

Our route took us from the desolate Judean to Ein Gedi and Nahal David—David's Spring. We walked the path along a gorge, under the gaze of rock hyrax and the solemn eyes of Nubian ibex. Two thousand years ago the springs belonged to the king and spice the value of gold was cultivated along its banks. Today the wealth of the place is not measured in spice or gold, but in the currency of all living things—water.

At the end of the gorge, a sheet of water cascades 60 feet into a pristine pool. Water droplets sparkle like champagne against the dark backdrop of moss. The humidity enveloped me. I could feel my parched skin stretch as it drank up the moisture. The vegetation, the sound of falling water, the very climate of the place is at odds with the land.

After encounters with Cretzschmar's bunting, chiffchaff, Arabian warbler, bluethroat, Smyrna kingfisher, blackstarts, and redstarts on the grounds of the Ein Gedi Guest House, we enjoyed a leisurely 15-minute dinner, were herded into desert vehicles, and driven to a nocturnal stakeout for glimpses of foxes, hyenas, and wolves. Then we drove to an inn where Yossi let us retire, urging us to turn in quickly because we had to get "an early start" the next day. We wondered just what constitutes an early start to the likes of Yossi Leshem.

Early to Yossi means 4 a.m. After rousing us out of bed, hurrying us down to the breakfast hall, and loading us onto the bus, he wished us a hearty good morning and proceeded to outline our itinerary which consisted of 80 or 90 events, including the much-heralded Eilat.

Eilat is a seashore resort planted right at the bottleneck of Old World migration. If likened to the bulbs of an hourglass with Europe and Asia above and Africa below, Eilat lies at the neck through which millions of birds must pass. From March through May passerines and shorebirds swarm over the agricultural fields and salt pans that lie on the north edge of town. Raptors, hundreds of thousands of them, lift off the desert floor each morning and pass over the heads of beachgoers and birders.

If Yossi knocked on our doors at the hotel that first morning in Eilat, we never heard him. Dawn found us outside watching the short-toed and bimaculated larks, wagtails, bluethroats, and redstarts. Southwest of town we drove to an SPNI hawkwatch point to see hundreds of steppe eagles, accompanied by black kites, steppe buzzards, and an Egyptian vulture, ride the heat-warped air currents aloft. The official counters apologized. They had hoped for a good day; this, they claimed, was merely average.

In salt pools, shorebirds worked the edges, gulls and waterfowl crowded the center. Black-winged stilts, avocets, curlew sandpipers, little stints, spotted redshanks, greenshanks, ruffs, slender-billed, lesser black-backed, and an adult great black-headed gull made up the roster.

On the fields north of town, several sociable plovers showed up, and a flock of Caspian plovers made even the European members of our troop buzz with excitement. That evening, Yossi staked out a pumphouse and we watched a group of Lichtenstein's sandgrouse come down to drink. In short, the birding was spectacular.

Today the wealth of the place is not measured in spice or gold, but in the currency of all living things—water.

The penultimate day of the tour found us driving north toward the Negev Desert, probably among the most inhospitable places on Earth and one of the most beautiful. Black and tans, ocher and chalk are the colors of the Negev. Baked under a yellow sun by day, cooled by the blue light of stars at night, the Negev suffers only those creatures clever enough to mold their lives along the rim of existence. It is a place that I have wanted to see for years, a place to fulfill a lifelong ambition—to experience a desert sunrise.

And there I was that final morning, waiting with a mongrel dog for something to happen. Then, far down along the slope, something moved. I brought my binoculars up and trained them on the spot. Nothing. I waited, trusting my instincts instead of my eyes. Past the point of comfort, but before my arms began to tremble with fatigue, one of the gray rocks stepped away from the rest. A chukar partridge.

It moved in a slow, even walk that avoided spurts or breaks in rhythm that could catch a hunting eye. I became aware by degrees that other birds were in the group; 15 chukars fanned out over the ridge, widely spaced for safety. I looked up at an Egyptian vulture which was regarding me curiously. I have no idea where it came from.

A shout from the direction of the camp brought my head around. Our group was out in force. Two members of the party were gesturing at the vulture, several others were closing in from behind.

The dog yawned and regarded me passively.

"Wanna head back?" I inquired.

He thumped his tail twice, then he stood, stretched fore and aft and trotted off. I followed, headed for breakfast and a last day of traveling with Yossi. □

Pete Dunne is natural history information director of the New Jersey Audubon Society.

The Spice of Bird Song

DONALD E. KROODSMA

REPRESENTATIVES of the passerine order from the entire continent had responded to the invitation. This was a momentous event, the chance for birds to compare once and for all the vocal skills nature had honed over eons of natural selection. Sparrows, buntings, wrens, mimids, warblers, blackbirds, thrushes, flycatchers—all were gathered at the great convention, each one eager to display his tunes. The judges were perched and waiting. Their criterion was simple: whichever bird could produce the greatest variety of songs would be the winner.

The finchlike birds went first—chipping sparrows, field sparrows, white-crowned sparrows, white-throated sparrows, savannah sparrows, lazuli buntings, and indigo buntings. They sang and sang, but as the performance dragged on it became clear that each bird could manage only a single song. There were minor variations, but the judges were unanimous: the score for each bird was a resounding "1." Song sparrows and northern cardinals fared somewhat better. Each began by repeating a single song for several minutes, but just as the judges' attention waned, the songsters introduced a second, third, and fourth song until after an hour, 10 songs had been produced.

Species after species performed. Flycatchers scored low: alder and olive-sided flycatchers sang one song, eastern phoebes two, and eastern wood-pewees and willow flycatchers each sang three different songs, but that was the limit among these birds.

The warblers managed to do better. The ovenbirds and common yellowthroats sang only one primary song, but an occasional flight song raised their scores. Blue-winged warblers sang mostly a relaxed *bee-bzzz*, but during aggressive encounters each bird increased his singing tempo and used a second song.

Chestnut-sided warblers were even more exciting. The judges detected three distinct forms of the *please please pleased ta meet'cha* song. In addition there was considerable variety in songs used during male-male rivalries, each variant depending on the intensity of the interactions. But even though the judges were impressed with this added dimension, they had to rate the warblers low in variety.

Thrushes also were mediocre in variety although they scored well in aesthetics. Veeries sang but one liquid *vee-ur, vee-ur, veer*. Swainson's thrushes produced three to seven songs on slightly different scales; wood thrushes sang about 20 permutations of 10 to 14 song elements. American robins were thrush champions, mastering up to 70 different syllables in their clear, whistled caroling.

Blackbird scores were mixed. Redwings sang two to seven forms of *konk-la-reeee*, but they too added another dimension to the competition: each male scored in relation to his age, indicating that he had learned about one new song each year of his life. The meadowlarks were a real surprise. Here were two species, almost identical in appearance, but stunningly different in voice. Western meadowlarks sang five to 12 flutelike songs, but each eastern cousin performed 50 to 90 clear slurred whistles, *tee-you, tee-yair*.

Two groups with exceptional vocal acrobats, the wrens and the mimids, were next. The Bewick's wren sang 10 to 20 songs and the Carolina wren impressed all with 40 different renditions of *tea-kettle, tea-kettle*. But the champion was the marsh wren—one from San Francisco perched upon a waving cattail and rattled off 210 songs in 45 minutes. The New York and North Carolina marsh wrens, knowing they could muster only 55 and 30 songs, respectively, decided to pass.

This left the mimids. The northern mockingbird impressed the judges with his ability to mimic most of the sounds heard during the competition, but the maximum number of 244 songs from a Kansas bird was not much greater than the wren's. Finally, a bored-looking brown thrasher took center stage. Relying on enormous brain centers for controlling his massive vocabulary, he inundated the judges with sounds. An hour later, the tally sheets were jammed and the judges had lost count at over 2,000 different songs. The thrasher's genius seemed to lie in his ability not only to repeat favorite songs, but to improvise new ones.

There was no doubt who should receive the blue ribbon for variety, but the question "why" remained unanswered. Each delegation was successful and competent by its own standards, yet the disparity among groups was enormous. Why did some have only one song while others had thousands? Why did the San Francisco marsh wren sing almost four times as many as the one from New York who sang twice as many as the marsh wren from North Carolina?

The facts on display at this mythical convention are astounding and perplexing to us humans. Despite decades of research we are still looking through a pinhole at a great world of bird song beyond. Practically all we know about the song of the thrasher, for example, is that he sings far less after pairing with his mate than he does before—but so does the male white-throated sparrow, who sings only one song. Why it might take

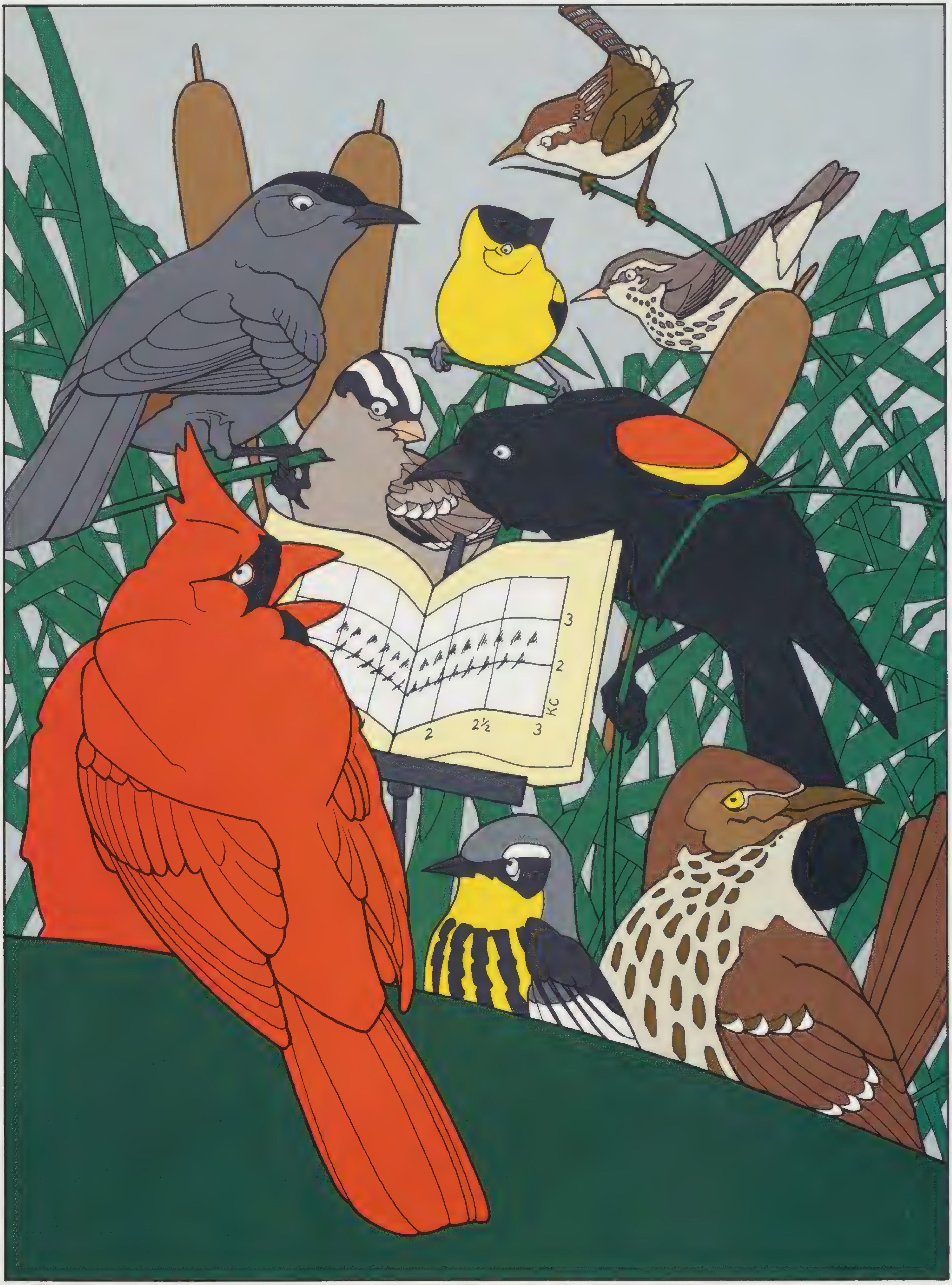


ILLUSTRATION BY TOM PARKER

ALBERT KUHNIGK (VALAN PHOTOS)

The curve-billed thrasher (left) has a large song repertoire while the grasshopper sparrow has a small one. Why it takes numerous songs to impress a female thrasher while a sparrow is satisfied with one or two is a mystery.

JOE & CAROL MCDONALD)

thousands of songs to impress a female thrasher while a sparrow is satisfied with one is a mystery.

One approach to understanding the evolution of song repertoires is to observe how birds use song variety. For example, the eastern meadowlark and Bewick's wren typically sing one song over and over before switching to another. But when a male is courting a female or contesting a territorial boundary with another male, he sings fewer repetitions before switching to another song or he may sing different songs in succession. These males may be displaying a greater variety of songs in order to stimulate females or to intimidate males.

Experiments using tape recorders have confirmed this idea. When recorded songs were played on the territories of male red-winged blackbirds, song sparrows, and European great tits, the attention of listening males was maintained longest when the variety of songs in the playback tape was greatest. Potential trespassers also seemed impressed with larger repertoires; when male blackbirds or tits were removed from their territories and replaced with loudspeakers, those territories from which large song repertoires were broadcast remained unoccupied longer than those from which smaller ones were played. It's possible that males associate large repertoires with older or more aggressive males. Another explanation, ingenious but perhaps farfetched, suggests that males may be fooled into thinking large repertoires come from a great number of individual males and that the area is therefore less suitable for occupancy.

Females also seem impressed with variety. Female canaries that hear complex songs build nests faster than females hearing simple songs. Male canaries continue to learn songs in successive years, and older, more experienced males are usually more competent mates and successful parents. Therefore, a female canary attentive to song variety may have a clue to the quality of her mate and her future reproductive success. Males of other species, including the northern mockingbird and red-winged blackbird, also learn new songs each year.

One study has demonstrated that reproductive success may be directly related to repertoire size. In European great tits, males with four or more songs produced more young that survived a full year than males with three or fewer songs. The link between repertoire size and breeding success is not clear, but it may be that males with larger repertoires are able to defend better quality territories.

Another approach to understanding the evolution of song repertoires is to compare the living conditions and vocal abilities of closely related species. The marsh wren and sedge wren, for example, are highly polygynous—males often attract and mate with more than one female. Both species have large repertoires, and both live in populations so dense that neighboring males often stimulate each other into a frenzy of singing. A variety of songs delivered with great speed may be needed to attract mates when space is limited and competition for mates is intense. Other North American wren species, such as the Bewick's wren and Carolina wren, tend to be monogamous, and individuals of these species defend larger territories; repertoires are usually smaller, singing rates are slower, and each song variant is repeated many times before another is introduced.

These trends are also apparent among different populations of a single species. San Francisco marsh wrens live on much smaller territories, are far more polygynous, and sing during a much longer breeding season than do New York wrens. The western wrens learn three times as many songs as their eastern cousins and seem to use this variety with greater urgency. By omitting or shortening pauses between songs, and by singing fewer repetitions of the same song, western males deliver highly contrasting songs at a blistering pace. Even though the western wrens are smaller than the New York wrens, the western males have about 50 percent more brain space invested in controlling their complex vocal behaviors.

Flycatchers represent a primitive family of perching birds and are at a disadvantage in the repertoire game. All other birds discussed here learn songs much like humans learn words. Learning permits the development of large vocabularies that are shared by other members of a population. Flycatchers, though, apparently do not learn their songs; evidence suggests that songs are encoded in the genes and that imitating other adults is not part of their developmental process. So, not only are songs simple and stereotyped, but repertoires are limited. The largest number of songs found encoded in flycatcher genes is only three, in the willow flycatcher and eastern wood-pewee.

But just as nearly 400 flycatcher species prosper in spite of their limited vocal prowess, some songbirds thrive on a single song. In fact, studies have shown an advantage to small repertoires; territorial birds find it easier to recognize neighbors that sing only one or a few songs.

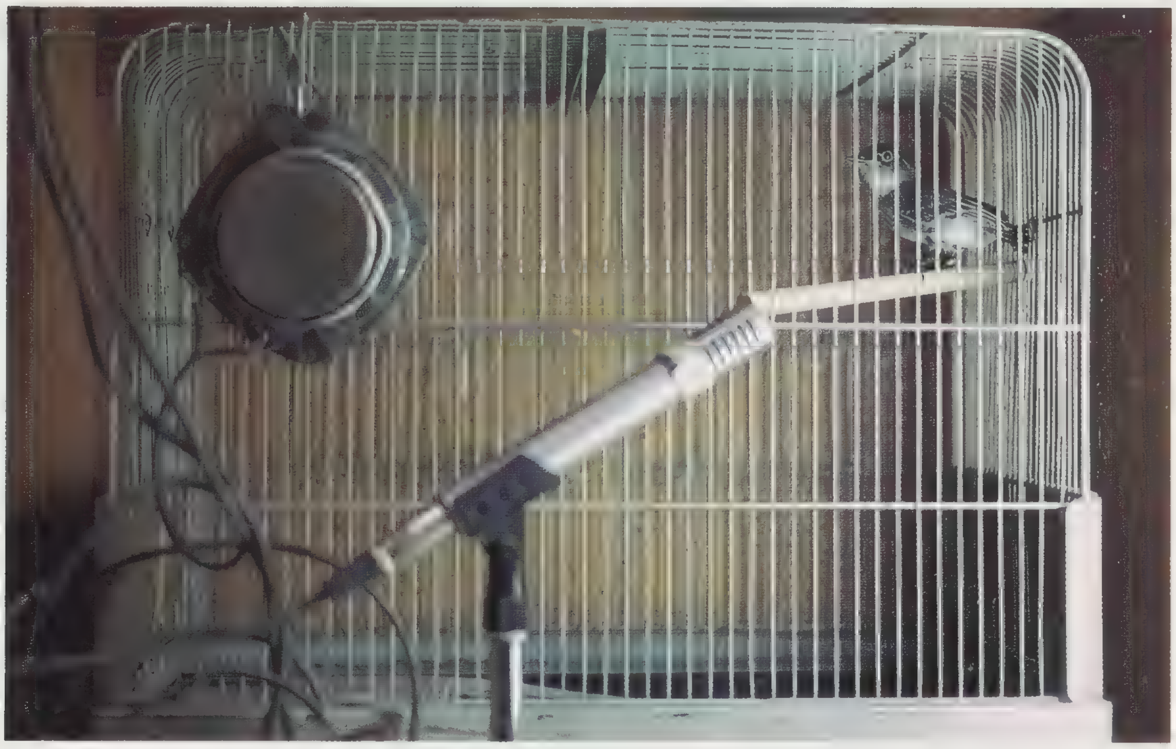
Why some repertoires are small while others are enormous remains an enigma. Perhaps the rules by which song variety evolved are not the same among different bird groups. Or perhaps chance events have led to different auditory and vocal capabilities in different groups and our insistence on finding a logical process for the evolution of natural diversity is doomed to failure.

We will never have all the answers, but we can hope to enlarge the pinhole through which we view the perplexing world of bird song. With ingeniously designed playback experiments we can ask the birds directly how they view their sounds. By comparing the ecology and life history of similar species, we may learn if song coevolved with other aspects of avian life. Discoveries of how sounds are processed in the brain will continue to provide valuable clues to how birds perceive variety. Studies in the species-rich tropics may lend insight into what is now a very biased, north-temperate zone view of bird song. Progress will be slow, but perhaps one day we will understand what birds are communicating with their great variety of songs. □

Donald Kroodsma is a professor in the zoology department at the University of Massachusetts, Amherst.

Further Reading

Jellis, R. *Bird Sounds and Their Meaning.* Cornell University Press, Ithaca, New York. 1984.



DONALD KROODSMA

BIRD SONG: LEARNED OR INHERITED?

Passerines (perching birds) and songbirds are often thought of as one and the same, but one North American group of passerines—the flycatchers—are not songbirds at all. Flycatchers may look like songbirds, but they actually represent a more primitive suborder of passerine called the suboscines.

Originally suboscines were classified as distinct from other passerines, known as oscines or true songbirds, because of a variety of structural differences. In particular the suboscine syrinx—voice box—is much simpler than that of the true songbird. Recently, however, I've done experiments which suggest that flycatchers differ from songbirds in another way. Unlike songbirds, which learn their songs from adults, flycatchers apparently have their songs encoded in their genes.

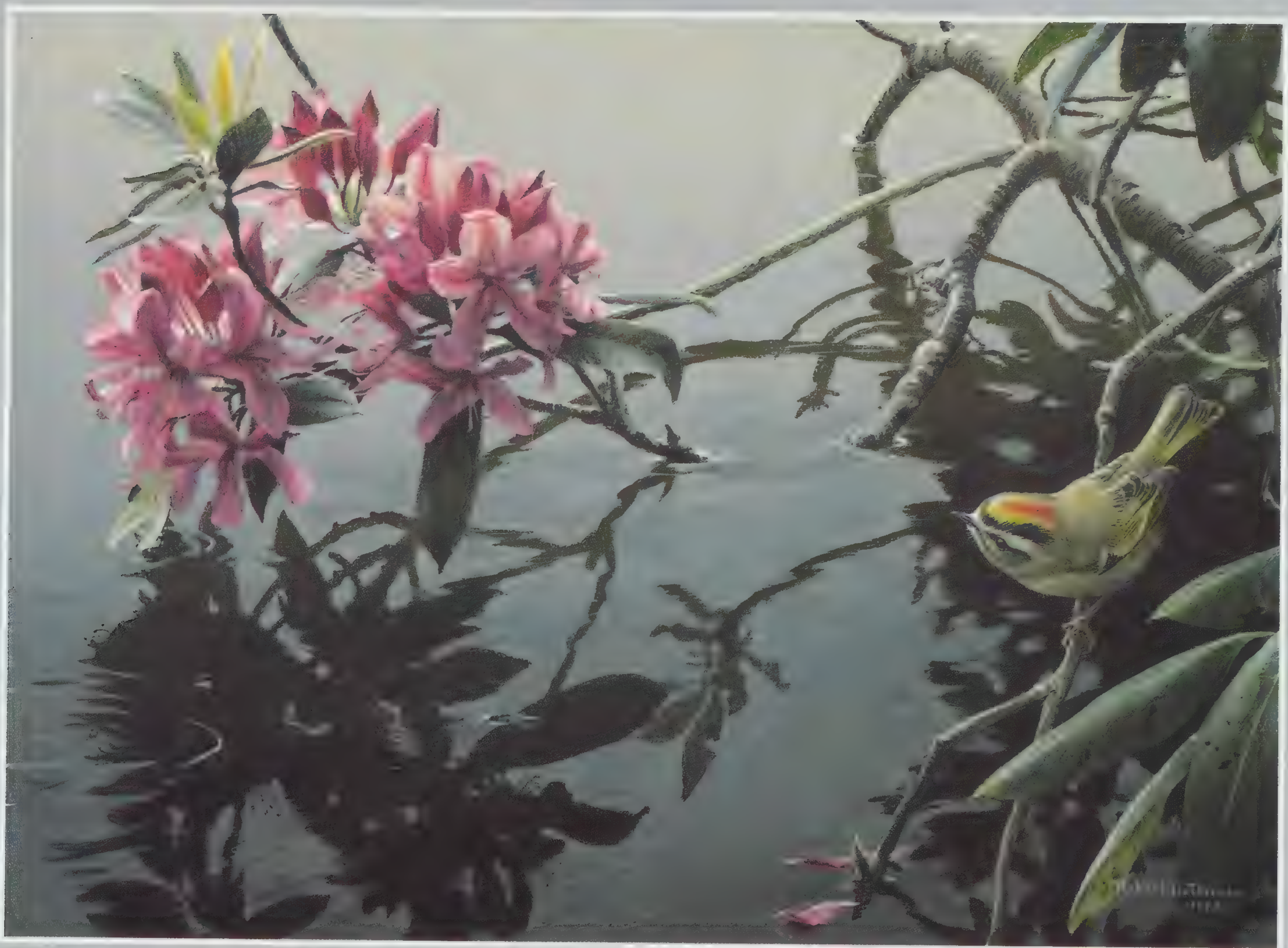
We have long known that songbirds are born with a rudimentary song. They modify this into the typical song(s) of their species by listening to and imitating adults. When raised in isolation songbirds grow up singing only the rudimentary song or they develop a song not typical of their species. When young songbirds are exposed only to the song of a different species, they may adopt the entire song or use portions to devise a song of their own.

Some evidence had suggested, however, that the songs of suboscines might be determined genetically rather than learned. For one thing, flycatcher songs are remarkably similar over wide geographic distances whereas many songbirds have regional dialects, a result of learning songs from neighboring birds. Also, some suboscines seem to lack the complex song-control centers that songbirds have in their forebrains.

Yet this indirect evidence alone was not convincing. Flycatchers could, for example, learn to sing by using different neural pathways than those used by songbirds. So to study suboscine song directly I did some experiments with two related suboscine species, the willow and alder flycatchers. I took nine one-week-old hatchlings from nests in Massachusetts—five willow flycatchers and four alder flycatchers—and raised them in individual isolation chambers, tutoring each with songs of the other species. If these flycatchers learned songs the way songbirds do, they would have developed highly abnormal songs or learned the songs of the wrong species.

But they didn't. Instead they sang songs typical of their species just as if they had grown up in the wild. This experiment proved that the songs of willow and alder flycatchers are inherited rather than learned from adults.

I had already obtained similar results with another flycatcher, the eastern phoebe, so it is possible that all flycatchers inherit their songs. It's also possible that other suboscines, including antshrikes, antbirds, and cotingas, inherit songs, but further studies are needed to determine this. The findings will be interesting from an evolutionary point of view, for they may suggest behavioral as well as anatomical differences in song development between the two passerine groups which diverged 90-million years ago.—D. K.



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Watching: White-breasted Nuthatches

DONALD AND LILLIAN STOKES

WE had been walking in the woods for over half an hour. The winter morning was bitterly cold and dry, but offset by a crystal blue sky and a sun that lit up the bare trees. We had set out on this walk determined to find white-breasted nuthatches and watch their behavior. We had chosen a mature, deciduous forest because it is perfect nuthatch habitat, providing food and nest holes. From the start of our walk we had strained to hear the slightest sounds of birds, but so far there were none.

Suddenly we heard a distant bird call, but it was too faint to recognize. Immediately we moved off the path and started bushwhacking through the sparse understory toward the sound. As we got closer we knew we had found our bird, for the sound was the ank-call of the white-breasted nuthatch.

With another 50 yards of stalking we spotted the birds, not one, but four, all within a 30-yard radius. With a quick glance through our binoculars we identified them as two males and two females. We could tell by looking at their heads—the cap of the male was solid black while that of the female was grayer or black with gray blotches. (Note that males and females cannot be distinguished south and east of the Ohio River, Pennsylvania and New Jersey.) The females were farther apart and feeding fairly quietly; the males were closer together and doing most of the calling.

Each male had his tail fanned and the feathers on his back fluffed in an unusual manner. One male had his head pointed down toward his feet. The males continued to give volleys of ank-calls and occasionally one flew at the other. This continued for about 10 minutes while the females remained nearby, occasionally giving pairs of ank-calls.

We were spellbound by the whole interaction and wondered what it meant. We had read much of the research on nuthatch behavior and from that had several clues. Throughout the year mated pairs of white-breasted nuthatches tend to live on their home range of about 25 to 45 acres. In late winter and spring they may defend a smaller portion of that as a territory which usually contains a suitable nesting hole. We also knew that the visual displays and rapid ank-calls of the males were used in aggressive encounters. Thus, we guessed that we were witnessing a boundary dispute between two pairs of nuthatches.

We are always intrigued by territorial encounters between birds since they point out divisions of the land that we would never perceive. The woods looked the same to us, but here we had come upon a spot that had special significance for these four birds. Such experiences are glimpses into a bird's view of the world.

After about 10 minutes the interaction dissipated and the pairs moved off in opposite directions. Their calls had now switched to the quiet ip-call, a contact note used between a paired male and female as they move through the woods. It acts like an acoustical string connecting the birds, loud enough to inform each of the other's whereabouts, but not so loud as to alert predators.

We began following one pair, moving quickly to keep the birds in sight. We tried to anticipate their direction so that when they took flight we could be closer to where they would land. Even though the two birds were never more than 50 feet apart, it was difficult to keep them in view. We were reminded of the advantages of behavior-watching as a team; each of us followed one bird and in this way we could see all the behavior that occurred.

This tactic paid off. Suddenly the female stopped foraging, crouched low, and became uncharacteristically motionless. At the same time the male's foraging activity took on an air of urgency. Within seconds he retrieved a food morsel he had stored in a bark crevice and flew to the female's branch. He ran to her and placed the food in her mouth. We had read about mate-feeding in white-breasted nuthatches, but had never seen it. It was so exciting that for a moment we forgot the cold in our fingers and toes.

Mate-feeding occurs in many common species. Why it occurs is not fully understood, but it is usually associated with the courtship phase of the breeding cycle. Thus, this pair of nuthatches was probably engaged in courtship—and it was only February.

Most people think mating behavior occurs only in spring and summer, but the more you look at birds, the more their actions contradict our stereotyped notions of their lives. Now that we know nuthatch courtship begins in February we eagerly await it every year and have enjoyed watching mate-feeding countless times.

About 15 minutes after we had seen the mate-feeding we heard a new sound in the distance—"werwerwerwerwerwerwerwer." We recognized this as the song of the white-breasted nuthatch, a sound given only by the male. We walked several hundred yards and spotted the singer. He was perched conspicuously at the top of a tree. As he sang he extended his neck and bobbed his head and body down with each repetition of the song. Then he stopped, came down lower, and looked for food in the crevices of the tree bark. He alternated singing and feeding for about 15 minutes.

Since we saw no female with this male, it is possible that he was single and announcing his presence in an attempt to attract a mate for the coming breeding season.

Our morning of watching white-breasted nuthatches had started slowly, but became highly rewarding as the morning progressed. We had seen the behavior of a lone bird, a pair, and a group; we had seen courtship, mate-feeding, and a territorial interaction; we had heard the ip-call, ank-call, and song; and we had discovered the invisible border between two nuthatch territories. All of this reaffirmed our conviction that there are always exciting things to discover about birds, no matter what species or season. ☐

Further Reading

Stokes, Donald W. and Lillian Q. *A Guide to Bird Behavior,* Vol. 2. Little, Brown and Company, Boston. 1983.

DARRELL GULIN

RESEARCH & REVIEW

Richard E. Bonney, Jr.

DUCKING THE ISSUE

In the autumn of 1979, 95-million ducks left their breeding grounds in Canada and the northern United States. Flying south on powerful wings, they headed for winter quarters in the southern states and Central America. Puddle ducks, bay ducks, sea ducks—all filled ponds, lakes and marshes across the country, and the flyways resounded with their calls.

By autumn 1985 the population numbered only 62-million, the lowest on record. That's a 33 percent decrease in just six years, and many people became concerned. Birders were upset because they had fewer ducks to watch, hunters were troubled because there were fewer ducks to hunt, and conservationists worried about the reasons for the decline and what could be done about it.

The U.S. Fish and Wildlife Service (USFWS) also was worried. This federal agency manages our country's waterfowl populations and stopping the decline was its responsibility. So the agency set stringent regulations on duck hunting during the autumn 1985-winter 1986 hunting season. Agency biologists reasoned that significantly reducing the season's kill might help the population to recover.

But the restrictive measures received mixed reviews. While some conservation organizations approved of the restrictions, other groups felt they were unnecessary, perhaps useless. Were they necessary? The controversy surrounding this question has revealed the complexity of the issue and raised important questions about the future of North American duck populations.

How do biologists know the duck population is declining? Each year the USFWS and the Canadian Wildlife Service census waterfowl on North America's most important duck breeding grounds—the "prairie pothole" country of midwestern Canada, the Dakotas, and Montana. This vast region dwarfs the state of Texas and is pockmarked with millions of small, water-filled depressions which more than half the continent's ducks use for nesting and rearing young.

The censuses consist of two stages. In May biologists use small airplanes to cruise over the pothole region, counting the ducks below. The birds have returned from their wintering grounds and are preparing to breed. Other crews make counts from the ground. In July the biologists determine how successful the breeding season has been by counting young ducks. Information from these counts is combined to estimate the total autumn population.

The 1985 censuses indicated that the population decrease which began in 1979 was continuing at an alarming pace. Numbers had dropped a staggering 22 percent in the last year alone. Declining species included mallards, black ducks, pintails, gadwalls, wigeons, shovelers, scaup, canvasbacks, and redheads. USFWS blamed the population crash on severe drought which began five years ago in the prairie pothole region and has dried up many thousands of the small ponds.

What could be done about the decline? USFWS couldn't refill dry ponds, but they could restrict duck hunting for the upcoming season. Based on the summer censuses, each September the agency determines the length of the waterfowl hunting seasons and the daily "bag limit"—the number of ducks a hunter can shoot in one day—for each state. During years of high populations and good productivity, seasons are long and bag limits large; during years of low populations and poor productivity, seasons are shorter and bag limits smaller.

Thus for the 1985–86 duck hunting season, USFWS set very short seasons and very small bag limits. Said agency director Robert Jantzen, "We need to take the pressure off these birds while their numbers are down so they have a better chance to rebuild more quickly when better habitat conditions return."

Some conservation organizations hailed the restrictions as essential. One supporter was the Defenders of Wildlife. "We applaud the Service for their recent move and we're pleased that they're finally headed in the right direction," declared Defenders wildlife biologist Albert Manville. The National Audubon Society also supported the restrictions. Audubon vice president John M. Anderson said that without tighter hunting limits there might not be enough breeding pairs left to take advantage of the habitat when the drought ends, further delaying the recovery.

But other groups disagreed. For example, Ducks Unlimited (DU), an organization devoted to waterfowl conservation, attacked USFWS on two counts. First, DU said the agency's 1985 duck population estimate was wrong. DU biologists agreed that the number of ducks heading south in the fall would be below normal, but said it would be greater than in 1984. Second, DU said even if duck populations are declining, hunting restrictions would not help the population recover because research has shown that hunting does not affect the size of the waterfowl population.

The National Wildlife Federation (NWF) also attacked USFWS, charging the agency with attempting to stem the population decline by restricting hunting instead of dealing with a more significant threat to ducks, the widespread draining of breeding ponds for agriculture. Said NWF vice president Lynn Greenwalt, "The most important impacts on waterfowl are the continued wholesale destruction and degradation of wetlands in the U.S. and Canada."

Who's right? Consider first the accuracy of the USFWS duck censuses. For practical reasons biologists don't count every bird on the prairie breeding grounds. Instead, they estimate the total duck population from sample counts made throughout the breeding region. There is room for error, but the counts are conducted the same way each year. Even if the exact numbers are wrong, the downward trend should be real.

DU also estimates duck populations each year, however, DU biologists count ponds, not breeding birds. Moreover,

JIM BRANDENBURG/DRK PHOTO

Prairie potholes occupy midwestern Canada, the Dakotas, and Montana. More than half of the continent's ducks breed here, and severe drought throughout the region has caused the North American duck population to plummet.

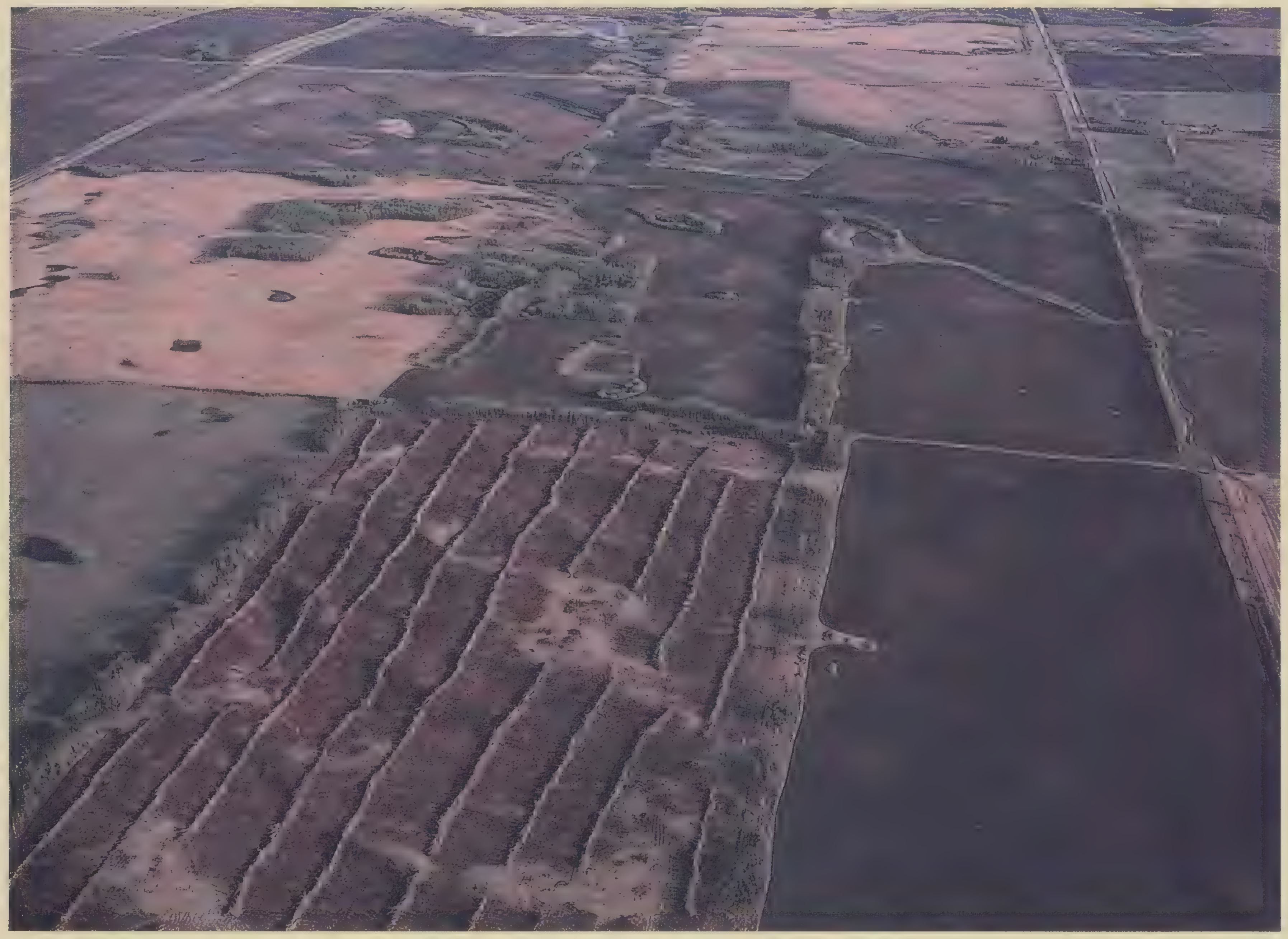
they count ponds only in Canada. This method does provide an estimate of breeding habitat available, and it's true that the Canadian prairies had more ponds in 1985 than in 1984. But this fact alone doesn't mean more young ducks were hatched.

Next consider the effect of hunting on waterfowl. It might seem obvious that shooting ducks would reduce the duck population, however, several USFWS studies suggest that the number of ducks which die each year is relatively constant, whether or not they are hunted. According to these studies, in years when hunting regulations are restrictive, fewer ducks are killed by hunters and more die of natural causes such as starvation, accidents on migration, and predation on the wintering grounds. In years when regulations are liberal more ducks fall to hunters but fewer die natural deaths.

One conclusion from these studies is DU's claim that hunting restrictions won't help the duck population to recover. But the studies also suggest that hunting may reduce the population if it drops below a certain level. Has that threshold already been reached? Says USFWS biologist Bob Trost, "So far there is no good evidence that hunting has any effect on the population. But we don't want to take any chances—the restrictive regulations for 1985–86 are precautionary." Meanwhile, the agency continues to study the relationship between hunting and population size.

That leaves NWF's concern—that the federal government is attempting to bolster waterfowl populations with restrictions on hunting instead of facing a greater threat, loss of breeding habitat. Even a hunting ban wouldn't preserve duck populations unless the birds have places to nest and raise their young. And such places are fast disappearing.

When the first European settlers came to North America about 127-million acres of wetland were present on the continent. Today fewer than 65-million acres remain. The rest have been drained for flood control, housing, and agriculture. The destruction is particu-



TOM MANGELSEN

Besides drought, the prairie pothole country is threatened by agriculture as thousands of potholes are drained each year to plant crops. Note the drained potholes in the foreground. If duck populations are to recover, remaining potholes must be protected immediately.

larly worrisome in the prairie pothole region where more than half the original wetlands have been drained for grain production. In the past five years drainage has accelerated because the drought has made potholes easier to empty. Even when the drought ends many ducks will have a hard time finding water.

If duck populations are to thrive, then prairie potholes and other wetlands must be protected immediately by whatever means possible, for example, purchase by the U.S. and Canadian governments, or economic incentives such as tax breaks or direct payments for farmers who preserve nesting habitat. And wetland preservation, says NWF, is where USFWS should be putting its effort.

In fact, USFWS has not completely ignored habitat preservation. More than one million acres are now protected in the prairie region, either by federal ownership or by easements. Yet some USFWS biologists estimate that nearly one million additional acres must be protected to maintain duck populations at pre-drought levels. That is just in the U.S.; another 3.5 million acres must be protected in Canada.

Will the North American duck population recover? Perhaps. The present crash is not unprecedented. Duck numbers were low during the dust bowl days of the 1930s and recovered when habitat conditions improved.

But managing the population so that it can recover again has become a complex problem. Several intertwined issues must be addressed: the need to census ducks accurately on the breeding grounds, to assess the impact of hunting on duck populations, and to protect the birds' breeding habitat from further destruction.

Time for studying and debating these issues may be running out. Meanwhile, ducks need all the help they can get. Hunting restrictions may be burdensome to duck hunters, but they seem necessary until populations recover or studies prove that hunting is not contributing to the decline. □

NEWS & NOTES

Compiled by Steven C. Sibley

LABORATORY of Ornithology cooperative research staff has recently completed two projects using data from Christmas bird counts to analyze population trends of North American birds.

The first project analyzed the number of black ducks reported on Christmas bird counts from 1950 to 1983. The results indicated an alarming 3 to 4 percent rate of decline in the population each year, with the number of black ducks in 1983 only 29 percent of what it was in 1950.

The second project examined population trends in eight species of birds of prey between 1970 and 1983. Here the results showed increases in populations that had been decimated by DDT poisoning by the 1970s. These species include gyrfalcons (+500%), prairie falcons (+145%), bald eagles (+92%), northern goshawks (+68%), merlins (+43%), red-tailed hawks (+33%), and peregrine falcons (+19%). The only species in decline was the Harris' hawk, whose population decreased by 38 percent. Reasons for the decline are unknown.

Results of both studies were submitted to the U.S. Fish and Wildlife Service, which provided grants for the research.

CORNELL'S Herbert F. Johnson Museum of Art and the Laboratory of Ornithology are sponsoring an art exhibition featuring the carrier pigeon. The display, "Wingtrace/the Sign of Its Track," comprises cage installations, drawings, audio tapes, and assemblages by noted California artist Joyce Cutler-Shaw. The show runs from May 10 through June 22. For more information, call (607) 255-6464.

DUCKS Unlimited, Inc. recently donated a record $1.4 million to the Migratory Bird Conservation Fund. The fund is administered by the U.S. Fish and Wildlife Service and is used to acquire habitat essential to ducks, geese, and other water birds.

DU raised the money through auctions held at local chapters throughout the U.S. and Canada to commemorate the 50th anniversary of the federal duck stamp. All land purchased will be added to the National Wildlife Refuge System.

ISRAELI air force uses the observations of bird watchers to reduce collisions between birds and jets by over 50 percent. Bird-airplane accidents are a problem in many parts of the world, but especially in Israel. Its geographic position at the end of the Mediterranean Sea makes it a major flyway for millions of birds of all kinds. Also, Israel is a small country surrounded by hostile governments, leaving little space in which the air force may train.

A two-pound bird striking a plane traveling at 500 miles an hour hits with an impact equal to 20 tons. The hundreds of bird-jet collisions occurring in Israel each year were causing millions of dollars of damage to jets and killing several pilots.

The air force now coordinates a network of bird watchers who are located at strategic points throughout the country to monitor bird movements. Besides shifting flight training exercises away from peak migration periods and key migration routes, the Israeli air force has adopted a new motto: Take Care—We Share the Air.

Immature long-legged buzzard in Israel: potential bird/airplane collision victim.

W. S. CLARK

Dear Member:

In 1974 I co-produced a film about bird song for the PBS "Nova" series. "Why Birds Sing" explored many facets of bird song: how red-winged blackbirds use song to defend their territories, how white-throated sparrows say "I'm a white-throated sparrow" to others of their species, how the brain controls singing and how birds acquire their songs.

Making the film was great fun. I liked taking films of singing birds, but even more enjoyable was discovering the extraordinary breadth of bird song studies. These ranged from observing bird behavior in the wild to conducting detailed examinations of brain cells.

In the years since the "Nova" program, progress has continued at a great pace. We now know more about why birds sing different songs—see Don Kroodsma's article in this issue. We also are beginning to understand the fundamental process occurring in birds' brains. Fernando Nottebohm at the Rockefeller University, for example, has shown that neurons in canaries' brains can grow and divide, a major surprise because previous thought held that once an animal's brain cells were formed they never divided again. This finding has important implications not only for our understanding of how the bird brain grows, but for how the human brain develops and might repair itself after damage.

Here at the Laboratory we plan to expand our Library of Natural Sounds to encompass a bioacoustics research center devoted to understanding animal sounds. The center would contain the latest computer equipment which can transform sounds into digital records that then can be analyzed or modified by the researcher. Information from these experiments is especially helpful in understanding the function and contexts of bird sounds in nature. The proposed center has sparked interest from other university departments as varied as linguistics, anthropology, music, and neurobiology and behavior.

The study of bird song has led in many exciting directions. We hope to make the Laboratory a central focus for future bird communication studies.

CHARLES WALCOTT, Executive Director

IBISES IN PERIL

DAVID E. MANRY

IBISES are among the most ancient living birds. Embedded in the oil shales of Europe are fossil ibises dating back 45-million years. During their early days, these long-legged, long-billed birds roamed the Eocene marshes, probing the primal mud and shallow water for invertebrate prey.

Today, 26 ibis species range primarily in the tropical and subtropical regions of the world. Most are highly gregarious, and their multicolored assemblages decorate the landscape in breeding colonies of hundreds, even thousands of pairs.

Throughout their history, numerous ibis species have evolved or become extinct in response to their changing environments. Currently, five species of ibis are disappearing, but not as a consequence of the evolutionary process. They are threatened with extinction as a result of an assortment of human-induced ills, including habitat destruction, pesticide contamination, excessive hunting, and disturbances at their breeding sites.

Each of the five endangered ibis species is faced with its own set of problems, and in each case only the highest level of commitment, ingenuity, and technical know-how that modern conservation management can provide will improve the chances of survival for these vanishing birds.

White (Japanese) crested ibis. Once numerous and widespread throughout Japan, northeastern China, and the Soviet Far East, only about 24 white crested ibises are known to exist today. The birds have been hunted for food and sport and their forest habitat has been destroyed for fuel, timber and agriculture. Despite international concern, efforts to save the species have failed repeatedly. In 1934, for example, a remnant population of about 100 birds was discovered on remote Sado Island and nearby Noto Peninsula off the west coast of Japan. It was granted immediate and full protection by the government, but poachers continued to bag the unwary birds while commercial tree cutting rapidly eliminated their breeding grounds. In 1962 a forest sanctuary was created on Sado Island to protect the ibises' remaining habitat, but by that time the population had dwindled to only six birds.

In 1965 an outdoor aviary was constructed in the heart of the mountain sanctuary. Over the next five years, six juveniles were removed from their nests and transferred to the aviary in the hopes of establishing a captive-breeding colony. Disastrously, all but one bird died of food poisoning and parasites contracted from their unnatural diets, while fledglings in the wild succumbed to pesticide poisoning. By 1983 only three white crested ibises remained in all Japan.

Although rescue efforts in Japan have foundered, promising developments in China herald renewed hope for the species. China may have been the bird's primary stronghold before hunting and habitat destruction wiped it out from most of its range. The last known breeding colony was extirpated in 1958 when trees harboring the nests were felled. For two decades afterward the bird's status in China remained a mystery.

Then in 1978, Liu Yinzeng of the Chinese Institute of Zoology began an exhaustive search for the bird. In May 1981, after traveling more than 12,500 miles in nine provinces, Dr. Liu and his co-workers located two nesting pairs in a remote mountain range. Despite egg predation by crows and a chronic shortage of feeding habitat, this tiny nucleus has fledged successfully a few offspring each year, increasing its size to 21 birds as of January 1986.

In 1983 two fledglings were outfitted with miniature radio transmitters with the hope that they would lead investigators to other ibis hangouts. In 1984 the Chinese government sponsored a two-day ibis workshop to formulate a recovery plan. The outlook for this gravely imperiled ibis is somewhat brighter thanks to Dr. Liu and his devoted team. [See story on page 28.]

Waldrapp and bald ibis. The waldrapp and bald ibis are the only two members of the family that breed exclusively on cliffs. The waldrapp was formerly wide-

Egyptian coffin of wood and gold leaf for the mummy of an ibis, circa 330 B.C.

Ancient Egyptians believed the sacred ibis was the incarnation of Thoth, god of wisdom and learning. Although the bird was regarded as a deity, a race of sacred ibis from Aldabra Island, near Madagascar, is endangered. Right, sacred ibis from Ethiopia.

INTERNATIONAL CRANE FOUNDATION

Only about 24 white crested ibises are known to exist today. Some are in captivity in Japan, including a female on Sado Island, shown above. Also endangered is the waldrapp, right; a small colony nests on cliffs overlooking the Euphrates River in Birecik, Turkey.

spread and prevalent throughout North Africa, Asia Minor, and the Alpine region of southern Europe, where it foraged for insects in gardens and meadows and nested on the walls of deserted castles.

Today, fewer than 100 breeding pairs remain at only eight localities in Morocco, and a single colony in Turkey. Situated on cliffs overlooking the hamlet of Birecik on the Euphrates River, the Turkish colony comprised about 1,000 birds in 1911. Living in amicable coexistence with Birecik's human inhabitants, the birds would return from their unknown winter quarters each February in concert with the spring rains. The citizens of Birecik celebrated the annual event with an elaborate feast. During the 1950s, however, DDT and other pesticides were sprayed on a massive scale throughout the region, exterminating hundreds of waldrapps in the process.

Even after the spraying ceased, eggshell thinning, a persistent by-product of DDT contamination, contributed to reproductive failure of the species. In addition, as Birecik's human populace grew, new housing was constructed atop the cliffs, leaving less room for nesting waldrapps. By 1973 only 22 breeding pairs remained. That year the World Wildlife Fund initiated a project aimed at reversing the colony's downward trend.

Although rescue efforts in Japan have foundered, promising developments in China herald renewed hope.

Under the leadership of Udo Hirsch, former breeding sites were cleared of human refuse and some ledges were widened and extended. In an attempt to induce the birds to nest away from the center of town, an aviary was constructed on a cliff just north of Birecik and stocked with captive waldrapps to act as decoys to lure their wild counterparts to the new breeding site. Within two years a few pairs had begun to nest there, and in 1983 eight pairs of Birecik waldrapps produced 17 fledged offspring, the highest number in six years.

Meanwhile the Moroccan waldrapp population has declined from 500 pairs in 1940 to fewer than 90 pairs today. Efforts are presently under way to stabilize the population and to protect a few of its important breeding and feeding areas. Fortunately the species adjusts well to captivity, and a number of breeding colonies have been established in zoological collections around the world. Someday it may be possible to reintroduce captive-bred waldrapps to parts of their former range.

The waldrapp's closest living relative, the bald ibis, lives in the mountainous grasslands of extreme southern Africa where it feeds on insects and other invertebrates, and breeds on mountainsides and near waterfalls. Al-

UDO HIRSCH/WORLD WILDLIFE FUND

though in no immediate danger of extinction, the birds have disappeared from much of their former range because of excessive hunting, commercial afforestation, and increased pressure from an exploding human population. Probably no more than 8,000 bald ibises remain, and this highly vulnerable bird should be monitored carefully.

Madagascar crested and giant ibis. Outstanding among the island's birds is the Madagascar crested ibis, a shy denizen of lowland forests and woodlands. Virtually nothing is known about the abundance and status of this colorful and elusive species, but the rapid pace of tree cutting throughout the island, in addition to illegal hunting, places it in peril. The bird's survival is inextricably linked to the preservation of its forest habitat. A well planned and managed system of parks and reserves would greatly benefit the ibis as well as numerous other Madagascar birds.

As the name implies, the giant ibis is the largest member of the family, comparable in size to a large goose. This solitary-nesting species once occupied the lower Mekong River system in Vietnam, Laos, Cambodia, and Thailand, where it foraged in swamps and rice paddies. The warfare that ravaged this region during the 1960s and 70s, however, combined with hunting and environmental damage by chemical defoliants, contributed to the demise of this mega-ibis. In the years following reunification of Vietnam the bird was presumed extinct, a casualty of war, but in 1982 Vietnamese ornithologists located a few pairs nesting in the Mekong wetlands, and a more comprehensive search for the bird is planned in the hopes of locating other populations.

In the years following reunification of Vietnam, the giant ibis was presumed extinct, a casualty of war.

Other ibises may also qualify for the roster of peril. Davison's black ibis of Southeast Asia, the dwarf olive ibis of Sao Tomé Island off the coast of west Africa, and the distinct Aldabra atoll form of the sacred ibis suffer from severe depletions of their numbers and face possible extinction in the near future.

Almost one-fifth of all ibis species are exceedingly rare and in urgent need of effective conservation management. The plight of the waldrapp and white crested ibis, species reduced to pitifully small, remnant populations barely capable of sustaining recovery programs, underscores the need for prompt action. In 1981 the Specialist Group on Storks, Ibises, and Spoonbills was created under the auspices of the International Council for Bird Preservation to determine the status of all members of these avian families. With successful intervention perhaps we can preserve this ancient and intriguing group of birds. □

David Manry is an avian researcher at the University of Colorado, Boulder.

Further Reading

Archibald, G. W., S. D. H. Lantis, L. R. Lantis, and I. Munetchika. "Endangered ibises *Threskiornithinae*: their future in the wild and in captivity." *International Zoo Yearbook,* vol. 20, pp. 6–17.

GEM OF THE ORIENT

ZHANG ZHI-YEN

SEARCH for white crested ibis—this was the task accepted by the Chinese Academy of Sciences from a vice premier of the State Council of the People's Republic of China in 1978. The white crested ibis is a species native to Asia and one of the rarest birds in the world. It was classified as a bird in need of international protection at the 12th World Conference on Protecting Birds in 1960. There were no white crested ibis in the Soviet Union or Korea at that time. A few were kept in cages in Japan, but they had lost their capacity to reproduce, being infirmed by old age. If scientists were to save the bird they had no alternative but to look to China.

Here the ibis is called Zhulu or Honghe—red-headed giant-heron. It used to be distributed throughout the country and until the 1930s was regularly seen by the local folk. But, although the bird was regarded as a deity, in fact its fate was very bad. The species decreased rapidly, and by the early 1960s only a few birds remained.

To search in China for ibis is like fishing for a needle in the ocean. The task was undertaken courageously by Liu Yinzeng, a scientist from the Chinese Institute of Zoology of the academy. There he studied specimens of 17 birds which had been collected from the whole of China, consulted the material of other scientists, analyzed routes, and otherwise prepared before starting his job in the wild.

He spent three years, from 1978 to 1981, and searched in nine provinces—climbing mountains and wading across rivers, eating in the wind and sleeping in the dew, sometimes having to deal with beasts of prey, and traveling 12,500 miles. The results—he saw not a sign of ibis, but he did find evidence of why it was almost extinct. He could hardly find a favorable circumstance for it to perch what with agricultural development, human and animal hunters, pesticide and other chemical poisonings, and the almost complete destruction of its wilderness habitat.

While Mr. Liu didn't find ibis, he did uncover two important clues: first, upon inquiries of a fisherman in Yang County in Shanxi Province, he learned that the district was indeed the haunt of ibis; second, he found three ibis feathers in a hunter's home in Hui County, Gansu Province, and was told the bird had been shot dead only two or three years before.

Returning to the institute, Mr. Liu reported these details to his leaders who encouraged him to continue searching the key regions. They even provided him with a motor car, increased his expense funds, and made a set of ibis slides for him to show the local residents.

In 1981 Mr. Liu again visited Yang County. He searched the plains and hilly land, but found nothing. Just when he was about to give up and move on, a peasant from a nearby village, Mr. Wu, ran over. He had seen the slide show at a cinema and said he had seen ibis.

Mr. Liu didn't believe him, for many egrets, herons, and white cranes had been mistaken by local peasants for ibis. Mr. Liu showed him an ibis photo and asked him to go once more and check his identification of the bird. Two days later the peasant returned and no sooner did he see Mr. Liu than he shouted, "Quite right, it's the very image of your photo!"

Together they drove to the mountains, then tramped three miles until they reached Jingjiahe, nearly 4,000 feet above sea level. There they found a nest bigger than that of heron and cruder than that of magpie, but was it ibis? Suddenly, Mr. Liu gave a cry—"Oh, it is true, God bless me!" For he noticed some footprints in the wet sand by a pool and after studying them he was sure—it was ibis. A living ibis had looked for food there within the past 48 hours. He had found nest number one.

He wound up and down a circuitous mountain route for the next two days, finally returning to Jingjiahe in late afternoon. Suddenly he looked up and saw an ibis flying toward him. "That's just what I seek!" Mr. Liu blurted out. "Ibis, why do you live in such a high place?" Recently, he realized, with development, the activities of people, and disruption of the environment, the ibis was unable to find peaceful shelter at the low elevations it prefers. Instead it was compelled to move to higher elevations of the mountain.

Mr. Liu pursued the direction of its trail and a week later came to Yaojiagou village. There he saw an ibis eating something in a field. An old peasant said "It has built a nest in a high tree nearby and three nestlings were born a

Climbing mountains and wading across rivers, eating in the wind and sleeping in the dew, surveying more than 12,500 miles of Chinese wilderness, Dr. Liu Yinzeng pursues the white crested ibis.

INTERNATIONAL CRANE FOUNDATION

Liu Yinzeng found two white crested ibis nests, but the birds' future remains in doubt. Above, captive white crested ibis in Beijing Zoo, China. Experts will consider the species out of danger if it multiplies to at least 500 pairs.

few days ago." Soon Mr. Liu found the tree, and as expected, three nestlings hid in the nest, popping their heads in and out, crying "ji-ji-jia." To Mr. Liu the sound was like the most beautiful music in the world and excited tears started from his eyes. He had found nest number two. Mr. Liu decided no longer to return to the village, but to stay in the valley in sight of the nesting tree. Someone in a motor car delivered food to him once a week.

Because of Mr. Liu's presence, the parent ibis dared not return home the first night. At about 11 that night, as Mr. Liu sat at the foot of the tree recording notes, he heard something fall to the ground with a crash. He flashed his torch and searched the ground for two hours lest a nestling had fallen and injured itself, but he saw nothing. Next morning he swept the region and was at the end of his rope when a boy ran over and said a nestling was behind his house. They rushed there to find a nestling, very hungry, cold and tired, no longer able to crawl. He asked the boy to collect some river snails and a frog, which he cut into pieces and fed to the starving bird. Then he placed it back in the nest, but after a while it again dropped to the ground. Mr. Liu was obliged to keep the nestling himself while he awaited instructions from his leaders in Peking.

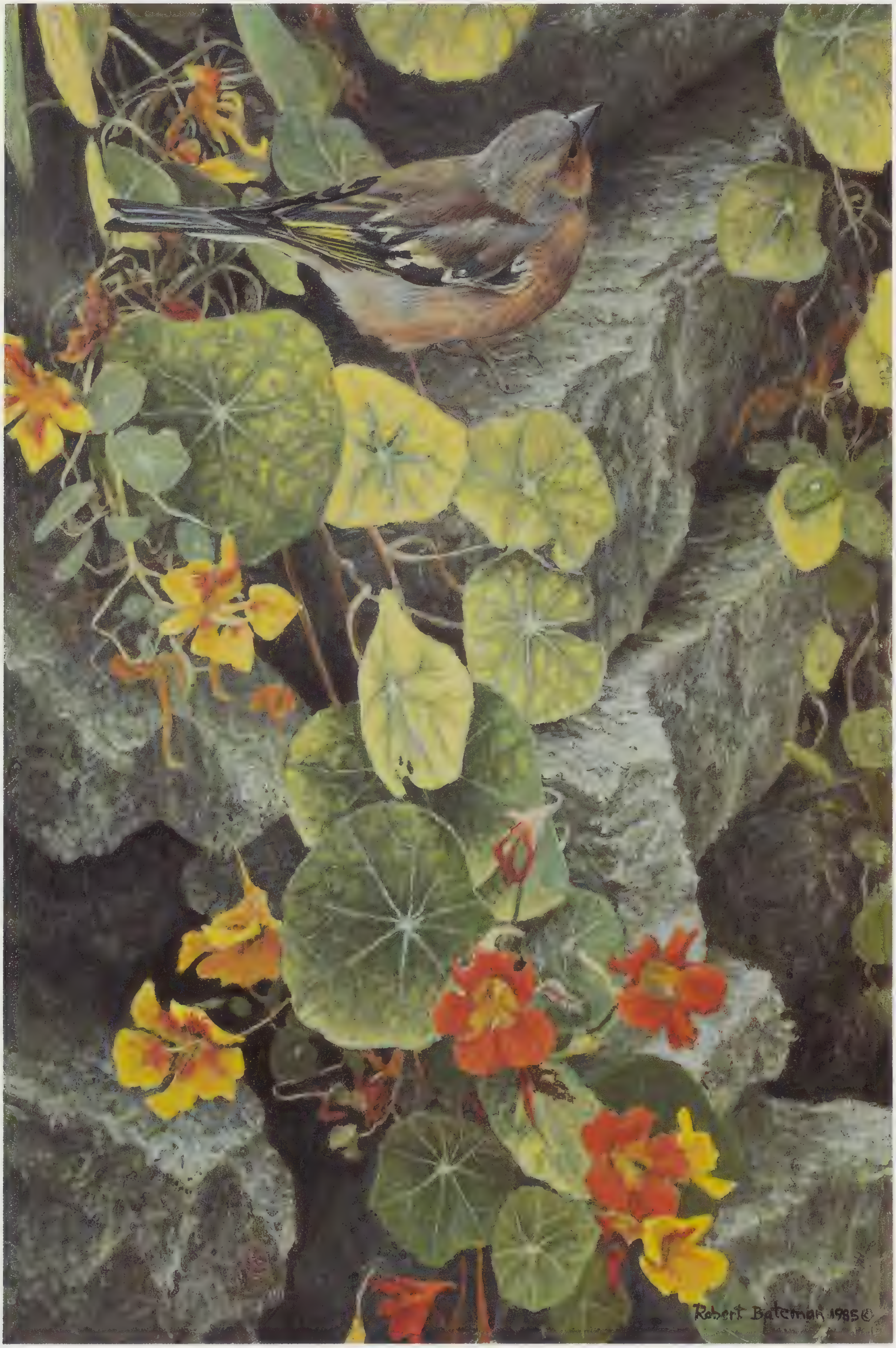
Three nestlings hid in the nest, popping their heads in and out, crying "ji-ji-jia."

By this time some photos and sound recordings of the nestling had reached Peking and the message "ibis found in China" had gotten around and caused a sensation throughout China's zoological world.

The number of ibis found in the two nests totaled only seven by the end of 1981. Emergency measures were instituted: anyone with leads to the whereabouts of ibis were offered rewards, anyone who killed an ibis would be severely punished, scientists were encouraged to carry on investigations about the bird's abundance and distribution, protection stations were set up, and other conservation steps were taken. Gradually the number of ibis increased—nine in 1982, 12 in 1983, and in January 1986, 21 ibis were reported in the wilderness.

Some key problems remain. Experts say the ibis is on the verge of extinction and can be regarded as out of danger only if it multiplies to at least 500 pairs. If we don't take effective action promptly, the ibis may fall into irretrievable condition. We suggest that scientists in every country carry out international cooperation using modern scientific capabilities to raise the ibis's egg-laying rate, hatching rate, and survival rate in order to save this rare gem from extinction. □

Zhang Zhi-yen is an ibis researcher from Gansu Province, People's Republic of China.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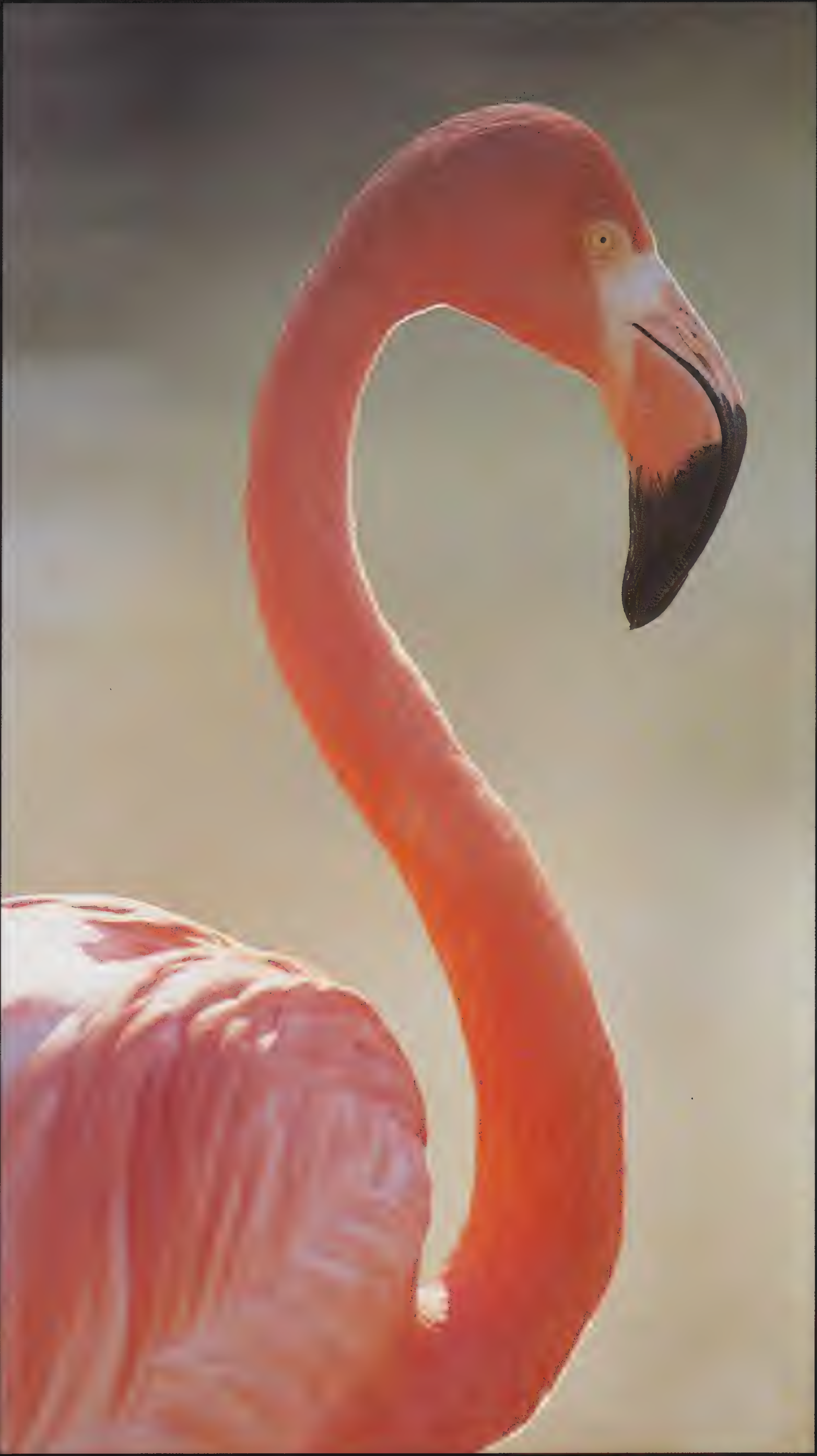
THE LIVING BIRD

Quarterly

Summer 1986



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The humid bayous of Florida where egrets fish, the guano-covered cliffs of Peru where seabirds squawk—Francis Lee Jaques has captured the feeling of landscape and bird on canvas and diorama.

p. 14 Dad and Junior

Front Cover: Outside–Secretary bird in Africa. A full-grown male stands about 3 feet 2 inches tall, with a wingspread of about 7 feet. Its crest suggests an old-fashioned clerk or secretary with long quill pens stuck behind the ears. Photograph by Rod Williams (Bruce Coleman Limited). Inside–Greater flamingo photographed by Gregory G. Dimijian (Photo Researchers, Inc.). **Back Cover:** Outside–Western gull eating starfish, Monterey Bay, California. Photograph by Jeff Foote. Inside–Passenger Pigeons and Mourning Doves, watercolor by Francis Lee Jaques, early 1930s. Bell Museum of Natural History, Minneapolis, Minnesota. **Above:** Northern jacana by R. & M. Borland (Bruce Coleman Limited).

Keeping Good Field Notes

UNTIL a few weeks ago, when I finally threw most of them out, I kept a stack of old birding checklist cards in a cigar box. That box of cards had traveled with me from place to place for nearly 25 years, although I almost never dug into it except to file a new card or when I was trying to decide whether to chuck the whole lot of them. I don't know why I saved the collection as long as I did; I guess essentially for the same reason one keeps ancient postcards from friends and family—because the checklists might still call up the spirits of beloved adventures. But in fact they were poor talismans. After a few months the tickmarks and numbers in the columns opposite the species names conveyed virtually no meaning at all.

Most birders usually go out birding for the pleasure and anticipation of small discoveries—adding to a list, finding unexpected species, noticing unusual behavior or hearing an unusual song, experiencing moments of startling bird drama or loveliness. The problem is, we promptly forget most of these discoveries, because we keep such sketchy records—or no records at all. Thereby we miss uncounted opportunities to savor recollections and to fix knowledge in our personal memory banks. Occasionally we also flub a chance to add to the body of scientific data about birds.

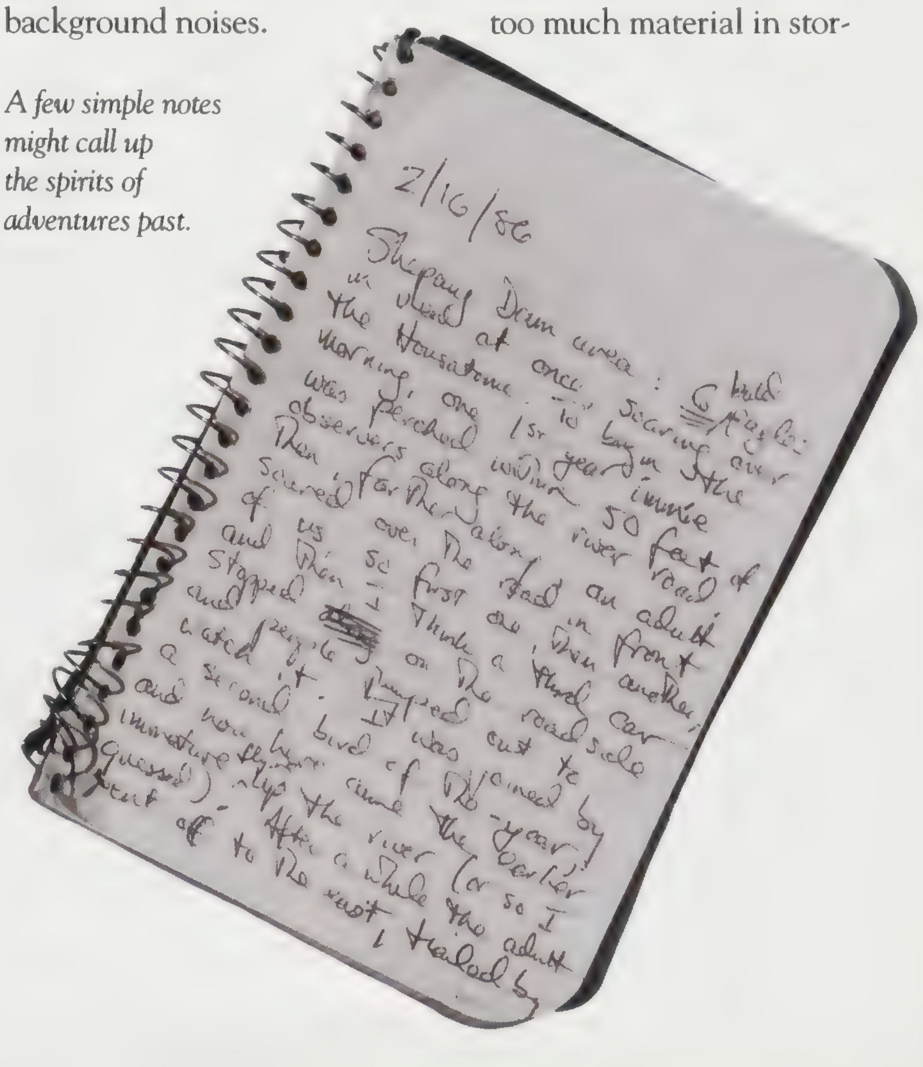
Mea culpa, I hasten to say. I'm often tempted to avoid note-taking altogether. If you're trying to cover ground—rush from image to image because the day's so short and the possibilities are so many—writing notes can slow you down and cause you to miss things that your companions see. But the rewards are enormous. Even a few words saved on paper can forever after call back a splendid moment or sequence. For example, I did not include in my recent Great Disposal one otherwise useless 1969 field card, because following my "X" beside "Yellowlegs, Greater" I had written, "including rescued bird." Instantly I can see in my mind's eye the odd behavior of that yellowlegs at the moment when my friend the Professor and I first noticed it. The bird was up to its belly in a rising tide, struggling to fly but caught on something under the surface—probably fishline, we thought. We waded out to it, and the Professor gently lifted it clear—along with the muddy clam that gripped one of its toes. Who ever heard of such a thing? Anchored like that, it would soon have drowned. It was exhausted, shivering, and helpless, so I carried it in my lap while we drove to our next birding stop, and by the time we arrived the yellowlegs had recovered sufficiently to return to its risky world.

I have tried different approaches to this business of saving images of birding trips. Now and then I even take along a tape recorder, so I can continue looking for birds while I'm making notes. The trouble with that is, if I do the job right I have to make my notes twice—first into the machine and then on paper, and if the expedition lasts all day I may have hours of transcribing left to do when it's over. No doubt about it, though, a tape can convey very powerful impressions. I remember one spring day when my friend the Professor was still a graduate student. We explored New Jersey's Hackensack Meadows, across the Hudson from New York City, and I brought along a big reel-to-reel recorder. We talked into the mike on and off all day, creating a memoir rich not only in words but in tones of voice and background noises.

The meadows had once been a huge and productive estuarine marsh—the sort of terrain that industrial "progressives" treat as wasteland, fit only for dumps. It had become a sprawling landfill by the time we saw it in the '60s—a sinister-looking, bad-smelling place. But puddles and patches of marsh still sprouted among the mounds of trash, and on that spring day there were birds all over the meadows. I realized there and then that, however sensitive to appearances we humans may sometimes be, birds are not aesthetes in any sense we'd recognize. The tape chronicled in particular our astonishment at a beautiful pair of blue-winged teal we found swimming in a pond that sprouted rusting kitchen appliances and an old bathtub.

Still, tape recording such adventures can leave you with too much material in stor-

A few simple notes might call up the spirits of adventures past.



2/16/86
Shepaug Dam area: 6 bald eagles
in view at once, soaring over
the Housatonic. To begin the
morning, one 1st year immature
was perched within 50 feet of
observers along the river road.
Then, for the [illegible] along, had an adult
soared over the road in front
of us so first one, then another,
and then I think a third car
stopped on the roadside
and people jumped out to
watch it. It was joined by
a second bird of the year
and now here came the earlier
immature flying up the river (or so I
guessed). After a while the adult
went off to the east, trailed by

Michael Harwood has written extensively for *Audubon, Natural History,* and *The New York Times Magazine.* Watch for A Birder's Notebook in future issues of *The Living Bird Quarterly.*

I realized there and then that, however sensitive to appearances we humans might sometimes be, birds are not aesthetes in any sense we'd recognize.

age—particularly if you go out birding more than a few times a year. I prefer written records; they are the most accessible. The act of writing does affect the pace of the birding, but on the whole it's a good effect. When I start to make a written record I concentrate my attention, and I notice more, and so there is more to delight me. A couple of examples by way of demonstration:

On one April 6, alongside a neighbor's farm, I heard "a high-perched robin singing a high, soft, tinkly, almost squeaky run of short phrases and trills, the phrases often repetitive, as if it were a thrasher or mocker doing an imitation. Some of the notes [are] almost juncolike. Every now and then the bird drops down into the normal register for a short, soft *cheery* or *pupup*. This goes on for several minutes without a pause."

On Penobscot Bay, Maine, on a first of June, I watched a small flotilla of common eiders, including young only a few days old, swimming near shore. "From the flock comes the basso quacking, mild growls, soft up-sliding and down-sliding moans, and soft owllike, pigeonlike hoots, as well as high *wheep*ing that may be from the ducklings. They travel and feed in a tightly bunched formation. The adult males chase each other, do modified head-throws, each snapping the head back to touch the back—his breast (salmon-tinted) puffed out. . . . Meanwhile, the black ducklings dive and pop up like synchronized corks, blip-blip-blip-blip, monkey-see-monkey-do." There's nothing very fancy about any of that, but every time I reread such passages I wish I took the trouble to make notes much more often.

The note-taking, which requires noticing, deepens one's connection to the experience, sharpens a point of view, and enlarges one's understanding of birds. It can even lead to reflections about the much larger frame in which the birding takes place. Here I am, for instance, on a cold, wet, windy afternoon at the end of January, walking along a ridge road in dairy country.

"From the top of the ridge," says my scribble, "the surrounding low blue and white hills loom faintly behind the screen of rain. The wet snowfences and the trees dully glow reds, and the standing weeds in snow dully glow golds . . . . In [a] weedy field . . . about a hundred snow buntings forage in the rain—which, blowing almost horizontally in my face, makes glassing the birds impossible. But this is fine weather for buntings, who care not a fig for glassing *us*!"

—**Michael Harwood**

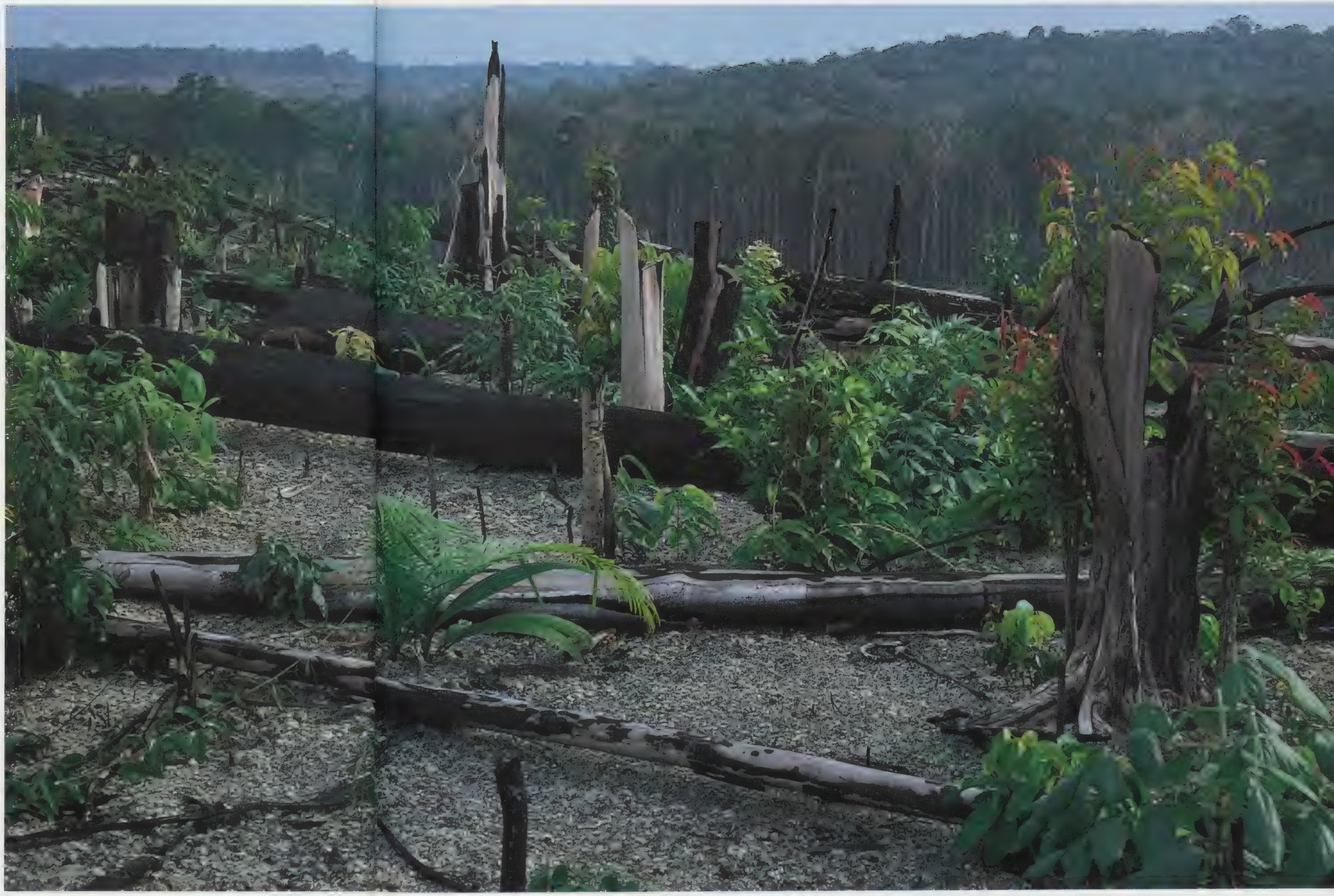
W. L. CHESS

Michael Harwood

LIFE ON THE EDGE

CARLOS E. QUINTELA

WALT ANDERSO



Burned wasteland borders untouched acreage at the MCS study site in Brazil, where vast tracts of rain forest are cleared each year for cattle pasture. Abrupt edges heat up and dry out remaining forest causing birds such as the white-chinned woodcreeper, below, to decline in numbers.

DOUG WECHSLER

WHEN you bite into a fast-food hamburger, you may unwittingly be contributing to the demise of tropical rain forests. The steer that produced your dinner may not have come from Utah, Kansas, or the plains of Texas, but from a pasture that was once rain forest in Central or South America.

Each year several hundred thousand acres of tropical forest are cleared for cattle ranches. The lean, cheap beef produced on these ranches is exported to the United States and other developed countries for use in fast-food hamburgers, hot dogs and other processed beef products. And as the cattle move in, the native wildlife moves out or dies. Birds, mammals, reptiles, insects, all lose their homes as the trees are cut or burned. In Brazilian Amazonia alone, 31,000 square miles—a chunk of land equal to South Carolina—were converted into ranches between 1966 and 1978.

Some people view the clearing of the rain forests as a boon rather than a problem. In fact, many Latin American governments provide economic incentives for agriculture. Between 1971 and 1977 international agencies provided $3.5 billion in loans and technical assistance to governments and individual ranchers to clear land for livestock production in Latin America.

But there's folly in this system. Most tropical pastures are ill-suited for grazing because rain forest soils are very poor. The useful life of pasture in Central Amazonia does not exceed five years. Hence, ranchers must move on, cutting more trees, leaving behind desolate clearings that may take a century to grow back to forest. If this process continues, a vast ecosystem crucial to the health of the entire planet soon will be damaged beyond recovery. (See page 10.)

Obviously the wildlife dependent upon forested areas is severely affected by clearing. Less obvious is that wildlife in the surviving forest is affected as well, because the remaining forests, once vast and continuous, have been broken up into fragments of trees surrounded by active and abandoned pasture and farmland. In many regions of tropical America all the remaining forest is in the form of fragments. Ostensibly these act as havens where flora and fauna may survive despite the deforestation around them. Biologists studying fragments, however, have reported severe reductions in the kinds and numbers of plants and animals that live within them, suggesting that their value as reserves is limited, and that the fate of tropical ecosystems may be even worse than originally believed. Why are plant and animal populations declining within tropical forest fragments?

To find out, ecologists began to study fragments as if they were oceanic islands. Although the resemblance is only superficial, researchers soon found that one theory used in island studies was also applicable to forest fragments. That theory is called the equilibrium theory of island biogeography, and it predicts that small islands far from the mainland will contain fewer species than large islands closer to the mainland. This is because small islands have higher extinction rates than large islands, and islands far from the mainland have small immigration rates because colonizing species have difficulty crossing large expanses of ocean and finding the islands.

In forest fragments the principles work the same way, except that the mainland for a fragment is the nearest large forest. Thus, the smaller a fragment and the greater its distance from a large forest, the fewer species it will contain. This is called the isolation effect.

Armed with this theory, biologists from the World Wildlife Fund–U.S. and the Institute of Amazonian Research–Brazil, joined forces in one of the largest ecological field experiments ever conducted, located 50 miles north of Manaus in the state of Amazonas. Called the Minimum Critical Size of Ecosystems Project (MCS), it set out to study the effects of tropical forest fragmentation on the plants and animals within fragments and to determine how small they could become and still support healthy populations. Beginning in 1979 researchers entered intact forests and fragments of various sizes to monitor tree, butterfly, primate, reptile, amphibian, and bird populations.

They found that the predictions of the equilibrium theory were largely upheld for birds that live in the for-

L. C. MARIGO (BRUCE COLEMAN LIMITED)

DOUG WECHSLER

Raiding army ants, left, are often pursued by warbling antbirds, far left, and white-plumed antbirds, in researchers' hands. The birds capture insects, spiders, and small vertebrates which are trying to escape the ants. When nearby clearings cause the forest floor to become hot and dry, both ants and birds disappear.

est undergrowth. The smaller the fragment and the farther it was from continuous forest, the fewer species of understory birds were present. In fact, one group of birds completely disappeared from the fragments. These were the army-ant following birds—woodcreepers and antbirds—that flock in front of raiding army ants, capturing insects, spiders, and small vertebrates which are trying to escape the ants.

Initially the MCS researchers attributed the disappearance of the ant-following birds to the reduction in forest area, which would have curtailed the birds' home ranges and possibly those of the army ants. As data accumulated, however, I began to wonder if something else was contributing to the birds' decline—the edge effect.

Edges are the areas where two dissimilar habitats meet. In temperate North America, edges usually contain a large number of species. The edge of a forest adjacent to a field, for example, generally contains more bird species than the core of either habitat because the edge serves as a meeting place where species with both habitat requirements may be found. In the Amazon, however, the situation is usually the opposite. Instead of being an area of species richness, forest edges generally have a very small number of bird species.

I began to suspect that edges might be affecting bird populations in fragments because the MCS researchers had discovered that edges were affecting the plants. Trees along the forest margins were dying faster than trees within the fragments. The edges were altering the microclimate of the forest margins and those fragments which were exposed to edges on all sides. Opening the forest to sun and wind made it hotter and drier. The warm moist floor rich in ground dwelling fauna was replaced with an accumulation of dry leaf litter. It seemed possible, therefore, that edges were affecting bird populations by reducing the birds' available prey.

LEE H. HARPER

Increased edge could also reduce the number of bird species in other ways. First, edges created by clearcutting are very abrupt. Unlike natural edges, they do not provide a gradual transition from open habitat to brushy shrubs to forest. Second, because even natural edge is relatively uncommon in Central Amazonian forests, few birds have adapted to take advantage of this kind of habitat. Third, unlike North American species, tropical birds are very specialized in their habitat requirements and few use both forest and open areas.

Because the edge effect is potentially devastating but poorly understood, I began studying it in detail in 1984 at the MCS site. The design of my study was simple. Using a series of mist nets, which harmlessly entangle birds so they can be identified, counted and released, I compared the kinds and numbers of birds present in three environments: in continuous forests, in natural edges formed by fallen trees, and in and near manmade edges created by clearcutting. After six months I had acquired some striking results.

The number of species in continuous forests and natural edges was almost identical. However, manmade edges contained far fewer species, and the closer to the edge of the clearcut I sampled, the fewer the species. Natural edges, therefore, did not reduce the number of species present, but manmade edges severely depressed the number. Furthermore, the number of individuals at manmade edges also was reduced, again in relation to the distance from the clearcut edge.

My studies, however, still did not explain why birds avoid manmade edges. To examine this question, I considered which species were most susceptible to the edge effect. I discovered, as had the researchers from the MCS project, that ant-following birds were particularly vulnerable. These birds, including white-chinned woodcreepers, and rufous-throated and white-plumed antbirds, were equally common in continuous forest and at natural edges, but they had practically disappeared from manmade edges.

Ant-following birds were not the only species missing from the edge. Also absent were non-flocking, ground foraging birds such as the white-necked thrush and the musician wren. These birds have vastly different social systems and foraging methods than the ant followers, but they do eat similar foods. Therefore, the disappearance of both groups from manmade edges is probably related to lack of

THE HIGH PRICE OF CHEAP BEEF

D. CAVAGNARO/DRK PHOTO

Tropical rain forests are the Earth's oldest, richest, and most diverse ecosystems. While they cover less than 10 percent of the Earth's land surface, they support almost half its plant and animal species and about 80 percent of its land vegetation. New species are discovered in the tropics each year.

Yet tropical rain forests are being destroyed faster than any other ecosystem. Worldwide, more than half have been cut down or burned since 1945, and currently an estimated 27-million acres—an area about the size of New York State—are destroyed every year. That's over 50 acres per minute.

Most remaining tropical forests are in Southeast Asia, equatorial west Africa, and the Amazon River basin of South America. For North Americans these places are remote and their futures may seem irrelevant. But the effects of tropical deforestation, such as mass extinctions and changes in the Earth's climate, will be felt close to home.

The forests are being cut for many reasons. In Central and South America they are cleared primarily to create pasture for cattle. Tropical ranches produce lean, cheap beef, most of which is exported to wealthier countries for fast-food hamburgers, hot dogs and processed beef foods.

More than half of the Earth's rain forests have been cut down or burned since 1945. Currently, 50 acres are cleared every minute.

Tropical forests are also cut for the exotic wood they contain such as teak and mahogany. Because these prized species are widely dispersed throughout the forests, huge areas are often destroyed to remove one or two trees. Still other rain forests are felled to make plantations of crops such as coffee and bananas. Like the lean beef, exotic woods and other crops are not usually consumed in the tropics but are exported to the United States and Europe.

All the effects of tropical deforestation are not known. Short-term effects are easiest to identify. As forests are destroyed, many species of plants and animals become extinct. Since new species are being found every year, it's possible that some may disappear without ever being discovered.

But it is the long-term effects of tropical deforestation that are most worrisome. Foremost in the minds of bird watchers is the effect of deforestation on migrant birds. Nearly half the species that breed in North America each summer migrate to the tropics in winter. As tropical forests are cut these birds have fewer places to go and, if they cannot adapt to the cleared areas, their populations surely will decline.

Another cause for concern is the potential effects of deforestation on the Earth's climate. Tropical forests hold half of the planet's carbon. When burned, they release huge amounts of carbon dioxide into the atmosphere. Some theorists feel that increased levels of carbon dioxide could warm the Earth's temperature sufficiently to melt part of the polar icecaps, raising the oceans and drowning coastal cities. Others predict a clouding of the sun and a cooling that could start a new ice age. Most agree that increased variability in the weather, whatever the outcome, already has begun.

What can be done to preserve the remaining rain forests? First, we must recognize the importance of the forests to the health of the planet and reduce or halt consumption of rain-forest goods whose production requires that more trees be cut. One way to do this is to end the subsidies that international organizations provide to Latin American countries for deforestation projects. The World Bank, for example, has loaned hundreds of millions of dollars for environmentally destructive projects such as the development of cattle ranches.

Another way to preserve the rain forests is to harvest their products in an environmentally sound manner. For example, researchers at the Centro Agronómico Tropical de Investigación y Ensenañza in Costa Rica are developing agroforestry—a method of planting crops within forests so that tropical farmers can produce food, crops, and valuable timber without cutting down huge numbers of trees.

Finally, the U.S. and other western nations can stop importing tropical wood and beef. Many desirable alternatives to teak and mahogany exist that are grown in North America, and only about 10 percent of our total beef consumption is imported. If all the beef eaten in the United States were produced within our borders, the price of a fast-food hamburger may increase by five cents, but the contribution toward preserving one of the world's most important ecosystems would be tremendous.

For more information contact: Rainforest Action Network, 466 Green St., Suite 300, San Francisco, California 94133, or World Wildlife Fund–U.S., 1601 Connecticut Ave. N.W., Washington, D.C. 20009.

Tropical forest reserves should be as large as possible to support birds such as the ornate hawk eagle, left, which needs 100-acre tracts of virgin forest to survive and reproduce successfully. Also, one 100-acre tract has less harmful edge than ten 10-acre tracts.

ALBERT KUHNIGK (VALAN PHOTOS)

food, specifically leaf-litter insects which cannot live in the edges' hotter, drier climates.

The impact of edge is important when considering the value of forest fragments as wildlife reserves. My study showed that the edge effect extended at least 50 yards into the uncut forest. Using this conservative estimate, a 2.5 acre fragment would be entirely edge, a 25-acre fragment would be 50 percent edge, and even a 250-acre fragment would have 20 percent of its area influenced by edge. Therefore, to be useful as reserves, fragments must be as large as possible, and the vegetation around them should be allowed to regenerate as a buffer zone which would reduce the edge effect by preventing wind from drying the undergrowth.

Fragmentation of the forest affects bird populations in another way. Not only are fragments mostly edge, but they are frequently too small to meet the food and shelter needs of pairs of many rain forest birds, especially larger species. A pair of harpy eagles, for example, will not survive and successfully reproduce in a 100-acre fragment because they can't find enough food. If a continuous forest is broken into small fragments, harpy eagles may have to abandon the area.

The good news is Amazonia still contains expansive rain forests. The bad news is that the cutting continues at a prodigious rate. Conservationists around the world are working to slow the cutting and to ensure more efficient use of cut forests so they don't need to be abandoned so quickly. The World Wildlife Fund has begun a campaign to identify valuable products that can be extracted from tropical forests on a sustained basis, without extensive cutting.

Conservationists are also working to preserve larger areas of forest rather than numerous small ones, so that the community of plants, birds, and other wildlife is affected as little as possible. MCS researchers are continuing to study what the minimum size of reserves must be, and their work is crucial to the future of the Amazonian rain forest. If the forests continue to be cut into small fragments, we may lose the flora and fauna of one of the largest and richest ecosystems on Earth. □

Carlos Quintela is a Ph.D. candidate in zoology at Louisiana State University, Baton Rouge.

Further Reading

Caufield, C. *In the Rainforest.* Alfred A. Knopf, New York. 1985.

Myers, N. *The Primary Source: Tropical Forests and Our Future.* W.W. Norton & Company, New York. 1984.

Soulé, M.E. *Conservation Biology: The Science of Scarcity and Diversity.* Sinauer Associates, Inc., Sunderland, Mass. 1986.

For more information on the MCS write: Pieter de Marez Oyens, Project Coordinator, Minimum Critical Size of Ecosystems Project, World Wildlife Fund, 1255 23rd Street N.W., Washington, D.C. 20037.

THE DATA GATHERERS

On ships, on shorebird feeding grounds, and right out back in the mist nets, MBO workers gather data vital to bird population studies.

On the bow of the Albatross IV, steaming down the continental shelf toward Cape Hatteras, is an intern from Manomet Bird Observatory. Despite the dusk that soon will settle and the winds of an October sea, she is on deck, clipboard in hand. Since 0530 that morning she has been below only twice—for lunch and supper—a routine she has followed for two weeks. The Albatross IV is a National Oceanic and Atmospheric Administration vessel doing studies on microscopic sea organisms called plankton. The intern is aboard as an MBO seabird observer.

Each half hour from dawn to dusk she conducts a 15-minute count, estimating the number of birds per square kilometer and noting species, color phase, age, and behavior. Ultimately the data she gathers will help to determine the distribution of seabirds along the coast. The work is exhausting and often accompanied by a queasy stomach, and when darkness falls there is still the task of transcribing notes onto computer cards.

Studying seabirds over the gray Atlantic is just one of many projects carried out by MBO, one of only three major bird observatories in North America. Begun 17 years ago as a small bird banding station, MBO has grown into a professional research and education center with programs of international scope. Although large studies are under way on a variety of nonavian topics, the observatory's research often focuses on birds because they are sensitive to environmental change.

DAVID TWITCHELL

MBO headquarters hardly looks like a renowned center of scientific inquiry. It lies at the end of a pothole-ridden dirt road 40 miles south of Boston. The gray building, once a gracious summer home, is now a conglomeration of banding lab, library, offices, kitchen, and bunk space. Among the old furnishings, dusty bird mounts, and topographic maps, 12 scientists organize and oversee MBO's operations.

The primary goal of MBO is to answer pressing environmental questions—how are seabirds and other marine organisms affected by oil spills? What are the effects of microwaves and radioactivity on birds? How has deforestation in South America affected migrant songbirds? The means to this goal is the long and tedious process of gathering data—the facts and figures needed to assess the health of wild bird populations.

One method of obtaining this information is through international seabird surveys like the one conducted aboard the Albatross IV. MBO began studying seabirds in 1976 when a western North Atlantic fishing grounds called Georges Bank was proposed as an oil drilling site. This region yields 20 percent of the world's fisheries' catch, but little was known about the seabirds in the area, leaving a vacuum of knowledge if an oil spill occurred.

MBO's objective was clear: to document the distributions of seabirds prior to oil exploration. Since 1976 MBO biologists, interns, and volunteers have logged thousands of hours taking censuses of seabirds from Cape Hatteras to Nova Scotia. As a result, MBO has documented the distributions and abundances of 44 seabirds, defined areas of seabird concentration, examined feeding habits, and estimated population sizes. In the second phase of the study, researchers will relate this information to oceanographic features such as temperature, salinity, depth, and distributions of plankton and fish.

Baseline data such as these have become increasingly important as the continental shelf comes under pressure from waste disposal, shipping, oil and gas extraction, and commercial fishing. Expert testimony from MBO is often sought at offshore oil lease hearings and by fishery experts who develop management models and set harvest quotas.

Another area where the collection of long-term and far-ranging data is vital is in the study of shorebirds. Because they migrate in large flocks and frequent the same stopover sites every year, shorebirds are especially vulnerable to manmade changes in their environment. For 12 years MBO has been carrying out studies aimed at identifying critical areas and discovering the reason for their importance to shorebirds.

ROBERT P. CARR (BRUCE COLEMAN INC.)

Though upside-down and tangled, birds are not harmed when captured in mist nets. Banders extricate the birds, weigh and measure them, and fit them with uniquely numbered aluminum bands. During fall migration MBO volunteers may band three or four hundred birds every day.

More than 500 birders in North, Central, and South America regularly survey local sites. The information collected is sent to MBO where it forms a database that now exceeds 200,000 entries on the distribution and abundance of shorebirds throughout the Americas. An analysis of these data has revealed some important findings. During spring migration, for example, more than 75 percent of all North American shorebirds are in just two locations—Delaware Bay and Cheyenne Bottoms, Kansas.

Project director Brian Harrington explains why shorebird data are invaluable. "The more questions we can answer—where do the birds concentrate and why, why do they prefer one beach to another, what resources do they need—the better we can predict the effects that development will have on the birds."

MBO soon will publish a shorebird atlas written for conservation agencies and planners that will provide information needed to protect key areas upon which shorebirds depend.

A third way MBO collects data on bird populations is by banding individual birds that fly over Manomet and get caught in the nearly invisible mist nets which have been erected to capture birds harmlessly.

"Banding is at the core of this organization," says Trevor Lloyd-Evans, chief of the banding program. Lloyd-Evans formerly worked at the British Trust for Ornithology where he banded land birds and studied hazardous gull concentrations at airports.

Every day, weather permitting, MBO volunteers and interns band from a few dozen to three or four hundred birds. Working deftly, the interns extricate birds from the nets and fit one leg with a uniquely numbered aluminum band. The banders record information vital to the understanding of a bird's health: species, sex, age, weight, parasites present, molting condition, amount of fat, breeding status. Later this information is computer processed and added to the database on the species.

At the height of fall migration MBO operates 50 mist nets which capture primarily thrushes, vireos, warblers, sparrows, and flycatchers.

"By measuring the number of birds caught per open net hour," says Lloyd-Evans, "we can detect changes in their populations."

In 17 years, MBO has banded over 200,000 birds of 220 species and has uncovered some enlightening facts. For example, Lloyd-Evans cites a 600 percent increase in the 1970s and early '80s in the number of bay-breasted and Cape May warblers that MBO banded each fall. He links the increase to an outbreak of spruce budworms in eastern Canada and Maine. Both warblers feed on budworms during the nesting season, and with a superabundance of food for their young, both species were very successful breeders. In the past two years, however, as the budworm population declined, the number of bay-breasted and Cape May warblers similarly declined.

Another valuable fact is the significant decrease in the number of northern thrushes MBO has banded since the late 1970s, a possible reflection, Lloyd-Evans surmises, of deforestation on the birds' wintering grounds in South America.

On ships, on shorebird feeding grounds, and right out back in the mist nets, MBO workers are gathering bits of information, not only about birds, but about harbor seals and whales, fire ecology, and methods of controlling salt marsh mosquitoes. On a remarkably low budget, MBO has acquired a wealth of data. Much of this information may not reap answers for many years, but through its careful and methodical collection, MBO hopes to use it for sound conservation planning. ☐

Elizabeth Cary Pierson is a freelance writer living in Maine.

Further Reading

Pierson, E.C. "Birds as Monitors of Environmental Change." *Orion*. Summer 1983.

LOVE AMONG THE ICEBERGS

ELAINE C. GRANDJEAN

On their breeding grounds at Hudson Bay, female phalaropes show some markedly male behavior—displaying, competing, defending, and then, leaving.

EARLY June at Hudson Bay: the lengthening days are turning the promise of summer into a reality. Only scattered patches of snow linger on the tundra, and the icelocked Churchill River is opening up to new life.

Many birds have returned from their distant wintering grounds to the edges of these icy waters to nest and rear their young. Lapland longspurs flock from the northern and central parts of the United States, northern pintails from Central America, golden plovers from Argentina, and red-necked phalaropes from the coasts of Peru, Argentina, and Chile.

Breeding in the arctic is an intense business. With only six weeks until the start of fall migration, birds must make the most of their opportunities to reproduce. As a result, male birds are busily displaying everywhere. Brightly colored northern shovelers are courting females in the shallows along the shoreline. Male Arctic terns fly overhead carrying fish to entice prospective mates, and male white-rumped sandpipers chase other males away from their females.

Meanwhile, in a pocket of an arctic pool, brightly colored female red and red-necked phalaropes display, court, and defend their smaller, drabber mates in a manner usually reserved for males. What is going on here?

It's called sex-role reversal and it is highly unusual in birds. In most species, males play the dominant role in courtship. They are usually larger and more colorful than their mates, which they defend vigorously from all other suitors. Males often play little or no role in building the nest, incubating eggs or rearing their young; housekeeping duties are left to the smaller, drabber females.

In a handful of species, however, the typical sex roles are reversed. Females are larger, more colorful and aggressive in courtship, while the smaller, drabber males build the nest, incubate the eggs and care for the young. Sometimes the female even produces a second clutch with another mate during the same season.

All three species of phalarope, red and red-necked, which breed in the arctic and subarctic regions worldwide, and Wilson's, which breeds on the flatlands and prairies of North America, belong to the 30-odd bird species whose sex roles are reversed. Even among these few, the extent of reversal varies.

Female spotted sandpipers, for example, are about the same size and color as males, but the females are more aggressive and defend territories while the males do most of the incubation. Male and female northern jacanas (a tropical water bird) have similar plumage, but the aggressive females are about twice as large as the males, which build nests, incubate eggs and care for chicks.

Outside of laying the eggs, virtually every aspect of mating is reversed in phalaropes. Females are larger and in breeding plumage are more colorful than males; they court males and defend them from other females, and they leave the males to incubate the eggs and care for the young. Other species with complete sex-role reversal include the Eurasian painted snipe and the button quails of Africa, Asia, and Australia.

A typical June day at Hudson Bay finds the phalaropes busily replenishing energy supplies severely depleted during migration from their wintering quarters off the coasts of South America. Like whirling dervishes, the birds spin around in circles in the small ice-free ponds, jabbing here and there for the mosquito larvae, beetles, and midges that form their summer diet.

But they are not so intent on feeding that they forget the purpose of their long flight north—mating. Here and there a female red phalarope stays very close to a particular male. Persistently she keeps to his side and when another female approaches, she quickly stretches her neck full length and points her stubby bill like a weapon. The warn-

Female red-necked phalarope

STEVEN C. KAUFMAN

TED LEVIN

ing is immediately understood and the interloper hastily moves away. Like many other birds faced with a short breeding season, this female has gotten a head start on breeding by forming a pair bond during migration.

As part of her defense strategy the female leads the male to a quiet part of the pond. While the pair feeds, the female keeps up a patter of short plunking sounds to which he responds in kind. Should the female momentarily lose sight of the male, she would initiate more intense calling that usually would bring the male flying back to her.

Besides acting as suitor and defender, the female phalarope takes the dominant role further. She chooses the nest site but, unlike other birds, it's not for her, it's for him. The male retreats to low shrubs nearby to scrape out a rudimentary nest hollow with his feet. There the female lays four eggs, depositing one a day until the clutch is complete.

Then the female abandons both nest and mate. Depending on food and male availability, weather, and other factors, she either joins other females in "hen parties" and leaves the breeding grounds, or she forms another pair bond and mates again. Meanwhile the male incubates the eggs for about 21 days. Within a few hours after hatching the precocial chicks can run, swim, and feed themselves, but the male shepherds them until they can fly in about two weeks.

The prompt exit of the female does not imply maternal indifference. With her colorful plumage and larger size, she would be an easy target for predators if she were to spend time on the nest. In addition she lacks brood patches, featherless areas of skin on a bird's belly that develop a rich supply of blood vessels during the breeding season. The patches function as a sort of avian hot-water bottle, warming the eggs and embryos within. Male phalaropes have brood patches, which are found only on females in most species.

Also, the female's early departure might make more food available for the rapidly growing chicks. In short, female phalaropes abandon their mates for the same reasons that males of other species leave theirs.

But how and why did the sex roles become reversed? The answer is uncertain, but to speculate, we must step back in time. Brood patches and the urge to incubate apparently are stimulated by two hormones, androgen and prolactin. Androgen also is responsible for the colorful plumage. In the remote past, both sexes may have produced equal amounts of these hormones. At that time the differences in appearance we see today would not have existed: both sexes would have been colorful and would have had brood patches.

The change to marked sexual difference in appearance and behavior could have been the result of a mutation that lowered a female's production of prolactin. (Today's female phalaropes produce very little of this hormone.) The result would have been a colorful female without brood patches or the inclination to incubate. Since the male would still have patches and inclination, he would carry out the parental duties. With her hormonal ties to the nest gone, the female would probably leave.

Male red phalarope, top right, is smaller and drabber than his mate. The female leaves the male in charge of raising the young, which can swim and feed themselves soon after birth, bottom right. Other bird species where traditional sex roles are reversed are the Eurasian painted snipe, male below incubating eggs, and Australian cassowary, male with chicks.

LEE LYON (BRUCE COLEMAN LIMITED)

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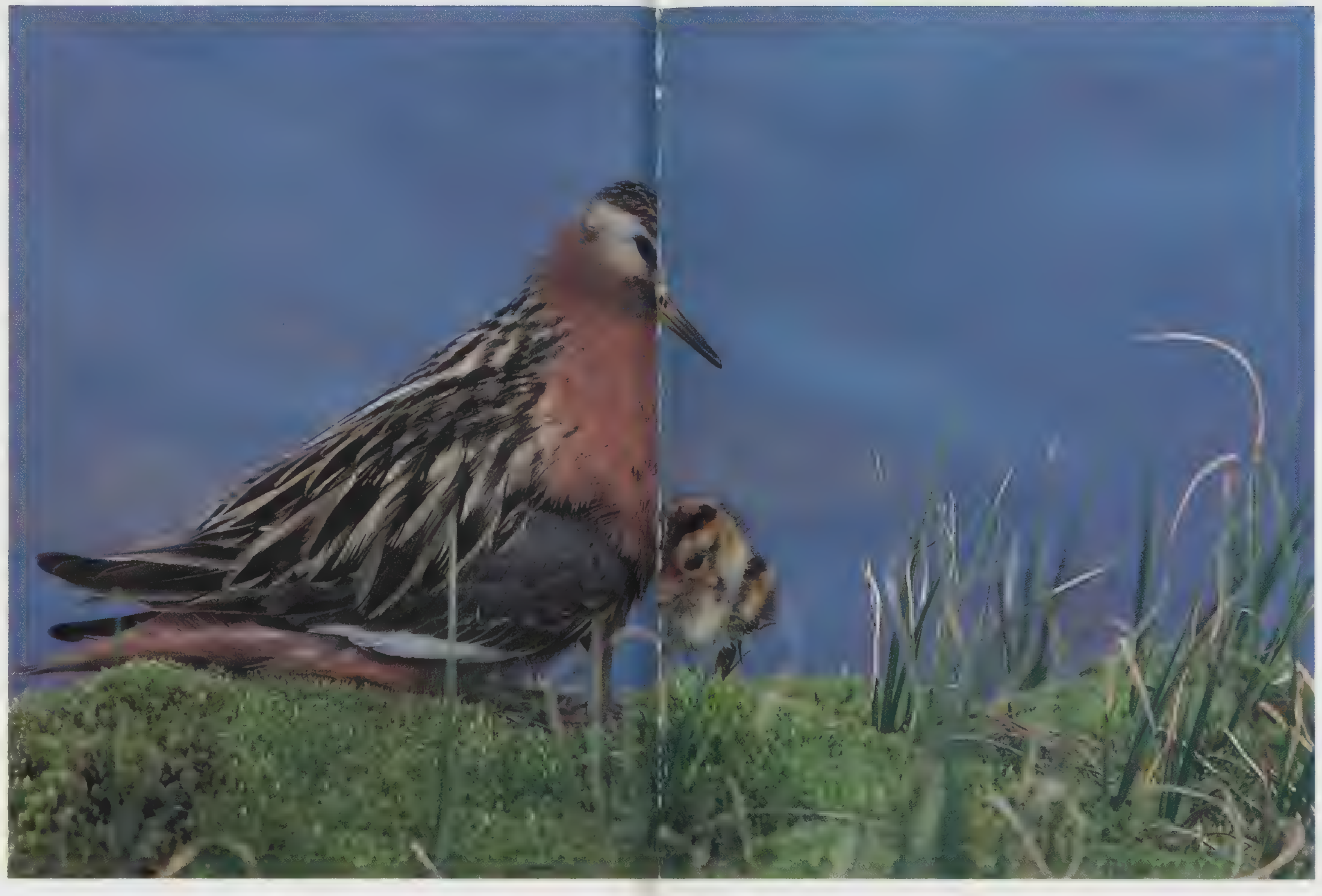
B. LYON (VALAN PHOTOS)



JEN AND DES BARTLETT (BRUCE COLEMAN LIMITED)

If the mutation proved advantageous and was passed to succeeding generations, the population would slowly evolve until the mutant females became the norm. At the same time evolution would cause males to become smaller and drabber since inconspicuous males would be the most successful at rearing young.

But what would be the advantage for males to raise the young? There are several possibilities. W.D. Graul and coworkers have suggested that reversed sex roles evolve primarily in birds that breed in areas where the season is so short and food so scarce that females have difficulty mustering the energy to migrate to the breeding grounds, produce eggs, incubate them, and replenish fat supplies for the long trip back to the wintering grounds. For such species, phalaropes and several other shorebirds included, it would be advantageous for the males to assume responsibility for incubation and caring for the young so the female could get an earlier start on migration.

It also is noteworthy that most species with reversed sex roles are polyandrous, that is, the female mates with more than one male, leaving a clutch of eggs with each. Sex-role reversal may have evolved as a means of facilitating polyandry. This mating system could also be important for a species with a short breeding season. It allows a female that lays a fixed number of eggs per clutch to produce more eggs in one season.

Finally, it is probably significant that most species which have reversed sex roles bear precocial young. Since they need little parental care, a single parent can easily raise them. Considering this, James Erckmann of the University of Washington has concluded that for species where both sexes participate equally in the reproductive process, male care and sex-role reversal may be just as likely to evolve as female care. There is no reason why females should be better at raising young than males.

Mid-July at Hudson Bay: the days are already shortening and fall migration is under way. Hudsonian godwits are beginning their long flight that might take them all the way to the Straits of Magellan; green-winged teal and northern pintail are headed for the southern U.S. and beyond, and semipalmated sandpipers are leaving for the West Indies or perhaps Peru. The phalaropes are going, too; first the females, then the males, and finally the young. □

The female phalarope takes the dominant role further. She chooses the nest site but, unlike other birds, it's not for her, it's for him.

Elaine Grandjean is an editor in environmental health for an international organization in Copenhagen, Denmark.

Further Reading

Haley, Delphine, editor. *Seabirds of Eastern North Pacific and Arctic Waters.* Pacific Search Press, Seattle. 1984.

Johnsgard, Paul A. *The Plovers, Sandpipers and Snipes of the World.* University of Nebraska Press, Lincoln. 1981.

BHL

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New Books

Bird enthusiasts and amateur ornithologists will be interested in two new books from Great Britain. Both are highly useful references which distill much of the current knowledge in ornithology.

A Dictionary of Birds edited by Bruce Campbell and Elizabeth Lack. 1985. Published for the British Ornithologists' Union by Buteo Books, Vermillion, South Dakota. 670 pages. $75.00 (cloth).

A Dictionary of Birds, which more accurately should be entitled an encyclopedia, is a successor to Sir Landsborough Thomson's 1964 classic, *A New Dictionary of Birds.* It is far more than a revision, however, because most of the material has been completely rewritten to reflect advances in ornithology over the past 20 years. More than 280 specialists from around the world contributed to this monumental work, making it comprehensive and authoritative.

The book is written in clear, nontechnical language and comprises hundreds of alphabetically arranged articles from abdomen to zygomatic arch. It includes long scientific articles such as that on molting, which explains why birds lose their feathers each year, and on flight, which describes how birds remain aloft. It also contains lengthy cultural articles such as one on birds in art, which discusses such topics as the frequent depiction of the goldfinch in religious paintings, and another on birds in music, where the reader learns that Mahler shot birds because their singing distracted him while he composed.

Shorter articles cover a wide array of topics such as belly soaking, crop milk, edible nests, distraction behavior, urbanization, and wing formula. And there are articles describing all the families of birds. It's hard to find an ornithological subject not discussed in this exhaustive volume.

North American readers may wonder how this book compares with John K. Terres' *Audubon Society Encyclopedia of North American Birds,* another excellent work. While the two books are comparable in size and cost, there are several differences. The *Dictionary* is more up to date on scientific findings, is more comprehensive, and has more detailed treatments of most topics. It is also more authoritative; however, it is scantily illustrated and has neither color photographs nor biographies of individual species. The Terres *Encyclopedia* is not as detailed, but deals adequately with most ornithological topics, and includes very useful bird biographies and beautiful color photographs of all North American species. On balance, for North American birders who don't want both books, Terres is the better choice.

The Encyclopedia of Birds edited by Christopher M. Perrins and Alex L.A. Middleton. 1985. Facts on File, New York. 447 pages. $35.00 (cloth).

This book is also poorly named. It is not really an encyclopedia, but a detailed description of the world's 180 families of living birds, arranged taxonomically (in the order in which birds are believed to have evolved), from ostriches to crows. For each family, information is given on appearance, food and habitat preferences, nesting behavior, and more. Maps depict the distribution of each family on the seven continents. Accounts are clearly written by 90 experts and are accompanied by superb color photographs and illustrations.

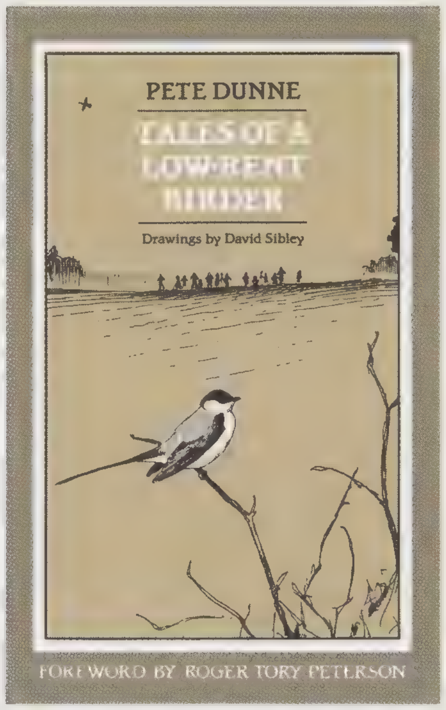
Because the book concentrates on the general characteristics of bird families, it usually is not useful for learning about individual species. Nonetheless it is an excellent and valuable work, and is superior to the only other book of its type, *Birds of the World* by Oliver Austin, which is far less detailed, partly outdated, and contains several factual errors. The *Encyclopedia* will appeal to professional ornithologists and armchair birders alike.

Tales of a Low-Rent Birder by Pete Dunne. 1986. Rutgers University Press, New Brunswick, New Jersey. 157 pages. $15.95 (cloth).

Pete Dunne loves to tell tales. He's an avid birder and since he makes his living as an ornithologist, he's usually broke. So it's easy to explain the title of this essay collection.

Explaining the contents is more difficult. Most of the stories are about birds and bird watching. Many take place at Cape May, New Jersey, where Dunne was sanctuary director for several years. Some are about studying birds, others about ignoring them.

The tones of the stories are as varied as the themes. They run from factual to conjectural, philosophical to satirical, compassionate to irreverent. There is one common thread: all are very good.



In "Billy Leeds and the Eagle," Dunne meets a crusty old codger in a Cape May salt marsh. Pete is watching hawks; the old man prefers to shoot them. What does a 30-year-old naturalist from suburbia say to an ancient local? "Birdathon 1983" chronicles the adventures of Dunne's Guerrilla Birding Team as it sets a new record for the most species seen in New Jersey in a 24-hour period. "First-year Bird" presents an hour in the day of a young and hungry red-shouldered hawk. "Thoughts While Waiting for an Ice Falcon" is a conversation between Dunne's conscious and subconscious mind that examines the drive that keeps dedicated birders in the field. "SVAT," the Species Verification Attack Team, stops at nothing—including dynamiting a farm—to help its clients find new species to add to their life lists.

Dunne escapes the traps that can make nature stories boring by avoiding the hackneyed, presenting the unexpected in the mundane, and applying his distinctive wit to every situation. Dunne's is among the freshest and most humorous outdoor writing to appear in a long time, and anyone who watches birds and contemplates the complexities of human nature should enjoy this book.

Iron Heads

Migrating birds have several methods of finding their way to and from their breeding grounds. Sometimes they determine direction from the sun, sometimes they follow the stars, and other times they apparently use the north–south orientation of the Earth's magnetic field. To navigate using the sun or stars, obviously a bird can use its eyes. But what kind of sensor would allow a bird to detect the Earth's magnetic field?

One possibility is that birds may have iron inside their heads. Robert Beason and Joan Nichols of the State University of New York at Geneseo recently have identified deposits of magnetite—a magnetically sensitive iron oxide—in the heads of bobolinks ("Magnetic orientation and magnetically sensitive material in a transequatorial migratory bird," *Nature*, vol. 309, pp. 151–153).

Beason and Nichols began their study inside a planetarium where their experiments showed that bobolinks, like many other birds, respond to changes in magnetic fields. Then the researchers examined the heads of 22 bobolinks, looking for magnetically sensitive materials. A series of tests indicated the presence of magnetite concentrated in sheaths around the olfactory nerve and in bristles which projected into the nasal cavity.

Because the magnetite occurs in high concentrations and is adjacent to nerve tissue, Beason and Nichols suggest that the material can sense magnetic fields and relay information about them to the birds' brains. Other researchers have previously discovered magnetite in the heads of homing pigeons, which are also thought to detect magnetic fields.

Bobolinks may have iron in their heads.

CARL R. SAMS II

Pest Control

Nesting season is a busy time for parent birds as they struggle to provide food for their ravenous young. There is little time for frivolous activity, nevertheless, many species of hawks and eagles adorn their nest with sprigs of green foliage, sometimes replacing them every day. Is it decoration or does the greenery serve some purpose?

Several functions that have been suggested are unconvincing. For example, the greenery could aid in nest sanitation by covering debris, but this doesn't explain why the material is brought to the nest before it becomes dirty. The vegetation could advertise nest occupancy, but it is brought to the nest even when eggs or nestlings are present. It could shade the nestlings, but birds that nest in tree cavities or below the forest canopy use greenery as often as birds with exposed nests.

Peter Wimberger of Cornell University has another explanation. Noting that green vegetation often contains naturally occurring chemicals which repel insects, he suggests that the sprigs in nests might repel or kill noxious parasites: fleas, ticks, and various flies ("The use of green plant material in bird nests to avoid ectoparasites," *The Auk*, vol. 101, pp. 615–618).

Nestlings can have big problems because of parasites. Most are blood suckers that can kill their hosts, and certain fly larvae winter in nests, emerging about the time the eggs hatch. Parasite infestation is one reason most birds build a new nest each year instead of reusing the old one.

JOHNNY JOHNSON/DRK PHOTO

Bald eagles may use aromatic greens for natural pest control.

Many birds of prey, however, do reuse their nests, and when Wimberger examined the nesting habits of 49 species of vultures, harriers, hawks, and eagles he made an interesting discovery. Of the species that decorate their nests, 80 percent reuse their nest, while only 40 percent of the species that don't decorate use their nest again. This suggests that the greenery helps to reduce parasites in a nest so that it can be reused. Among the few passerines that reuse their nests, starlings, purple martins, and American crows have also been reported to place fresh greens or the aromatic inner bark of western red cedar in their nests.

This is scant and indirect evidence that greenery repels parasites, as Wimberger points out. Further studies could be done in the field by comparing fledging success in hawk nests where aromatic greenery was experimentally added and subtracted. If more young hatch from the greenest nests, perhaps birds use a natural means of pest control.

—Richard E. Bonney, Jr.

National Science Foundation has awarded more than $190,000 to the Laboratory of Ornithology to support Dr. Charles Walcott's bird orientation research through 1988. The pigeon project, as it is called because that bird is its subject, is the largest bird orientation research project in the world. Work this summer is concentrating on orientation in relation to magnetic fields.

The administrative board of the Laboratory of Ornithology welcomes two new members: Stanley A. Temple of the Department of Wildlife Ecology at the University of Wisconsin in Madison, and returning after a brief absence, Robert G. Engel, group executive for corporate finances at Morgan Guaranty Trust Company in New York City. The board bade farewell to Morton S. Adams, Imogene P. Johnson, John D. Leggett, Jr., and Charles D. Webster. All four were tremendously helpful to the Laboratory during their four years on the board. Reappointed to second two-year terms were Robert Barker, Clifton C. Garvin, Jr., Mrs. Harvey Gaylord, and Joseph R. Siphron.

Dear Member:

What exhausting work, preparing a long-term plan for the Laboratory of Ornithology! Everyone here has participated: thinking, discussing, writing, and finally solidifying our thoughts. In the end our ideas of what to accomplish over the next five years were compressed into 16 pages of goals, a five year plan.

Was it worth the effort? Yes! As an exercise the plan forced us to focus our energies on the Laboratory's primary mission—to further the understanding of birds. As an end the plan sets goals against which we can measure our progress.

Here are a few highlights. First, we plan to make our cooperative research program the world's largest databank for information about North American birds. Over 35,000 volunteers already share their observations with us as part of ongoing bird surveys. This information is edited and compiled by Laboratory staff. Then, using the Cornell mainframe computer, we can look for changes in bird populations. So far we've found that populations of black ducks have declined over the past 30 years, while those of many birds of prey—including the bald eagle—have recently increased. These trends may be used as indicators of environmental change.

As part of our Library of Natural Sounds we are planning a bioacoustics research program which will analyze bird songs by dissecting them into their elements (frequency, volume, pitch). By doing so we hope to learn about the fundamentals of bird song and bird behavior. The program will also contribute to our understanding of other animal sounds. For example, Laboratory Affiliate Katy Payne has recently found that elephants make sounds too low in pitch for us to hear. These probably aid in long-distance communication.

On the education front we will soon be teaching a new course at Cornell, bird biology and ecology. This is a great opportunity for us to extend our facilities and expertise to Cornell students. In addition to classroom teaching, we plan to expand our local radio program, "Know Your Birds" by national syndication.

Our five year plan spells progress, but to get there from here will require a financial boost. So, as we plan our programs we must also establish a sound financial base. In this and other issues of *The Living Bird Quarterly* you will see notes about planned giving. The beauty of planned giving programs is that they offer as much financial benefit to a donor as they do to the Laboratory. Please review our announcements and write or call us if you desire more information. The Laboratory's road to the future may not be paved with gold, but with your help it will be passable.

CHARLES WALCOTT, Executive Director

Paul Schwarz, a specialist in computer programming, joined the Laboratory of Ornithology staff this spring. He is responsible for operating the SQL mainframe database management system used by the Laboratory's cooperative research program. SQL is used to organize information in the Nest Record Program and Colonial Bird Register, and from Audubon Christmas Bird Counts. SQL was given to the Laboratory by IBM in 1985 through Cornell's Project Ezra, one of about 20 programs through which IBM is donating computer hardware and software to major institutions for education and research.

Bird Banding Laboratory at Patuxent Wildlife Research Center is asking birders to report any color-marked birds they see. Licensed banders attach lightweight, metal U.S. Fish and Wildlife Service bands to several hundred thousand birds each year. Of these, a few thousand are also marked with colored plastic bands, nontoxic dyes, plastic neck collars, or plastic streamers. Many neck collars and streamers have identifying numbers or letters. The additional markers are used in special projects so that researchers may follow the movements of individual birds without recapturing them. The success of these projects depends on the reporting of sightings.

Color-marked birds should be reported to the Bird Banding Laboratory, Patuxent Wildlife Research Center, Laurel, Maryland 20708. Please include as much of the following information as possible: your name and address, date of sighting, exact location, habitat, species, number of individuals of that species present, colors of bands or markings, numbers or letters on markers or bands, and color combinations of bands.

— **Steven C. Sibley**

WILL POWER

Beyond your lifetime, birds will live on. So can your interest in them. With a little planning and a provision for the Laboratory of Ornithology in the form of a charitable bequest, your love of birds will endure. The task is simple yet the potential reward for our world's birdlife is tremendous. In addition, your action now may save your family estate taxes later. We can help ensure that your involvement with birds does not end with your lifetime.

For more information, please contact: Scott Sutcliffe, Office of Public Affairs, Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850. (607) 255-4288.

Bird Day Afternoons at The Crow's Nest Bookshop

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A visual wilderness experience with natural sounds and colors. No music or narrative. Hear water sounds, bird songs, the wail of a timber wolf, wind through the trees, thunderous skies, and the echoing cry of the loon. Observe wilderness green, glowing campfire embers, and mists over a far-off lake. A relaxing retreat at the end of a hectic day.

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New and completely revised, this diary is an excellent way to record all the North American bird species you've seen. Space is provided for the date and location of each sighting plus room for retaining special memories of birding adventures. Other features include quick-search guide, list of accidental species, and an index.

1986, laminated paper with wire ring binding, 224 pages.
No. 2058/$6.95/$6.26 members

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New and revised guide to bird classification, this volume has been updated to correspond with the sixth edition of the AOU checklist. Presents sketches of 34 orders and 185 families. Color illustrations of species selected to typify family characteristics.

1985, paper, 200 pages. No. 2391/$7.95/$7.16 members

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A collection of stories about birds and bird watchers. Dunne's is among the freshest and most humorous outdoor writing to appear in a long time. For anyone who watches birds and contemplates the complexities of human nature.

1986, cloth, 157 pages. No. 2397/$15.95/$14.36 members

Enclosed is a check or money order in U.S. funds, payable to The Crow's Nest Bookshop. Ou address—The Crow's Nest Bookshop, Laboratory of Ornithology, Cornell University, Sap sucker Woods, Ithaca, N.Y. 14850. (607) 255-5057.

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American Goldfinches

One warm July morning as we walked along a meadow brook lined by iris and alders we spotted something unusual. A small bird circled overhead with deep wingbeats, and a slow, stalling flight. We tried to identify the flight pattern, but no familiar gestalt came to mind. When we looked through our binoculars we were surprised to see a male American goldfinch. It was doing none of the typical behaviors of the species, such as its undulating flight accompanied by the *perchicoree* call. Instead, its flight was level and its call was a short explosive warble.

Whenever we see a marked change in a bird's normal behavior we watch closely, for these behaviors are often displays. Displays are instinctive actions and sounds that are part of a bird's communication system. By understanding them we gain new insights into what birds are doing.

The actions of the goldfinch were actually two displays. The flight is called flat-flight and the sound is called short-song. They are often performed by a male goldfinch over his breeding territory and may help advertise it to nearby males and his mate.

Knowing the male was over his territory, questions immediately came to mind. Where was the female? Had she built a nest? Was she incubating eggs? Hoping to spot her, we decided to sit down and wait. As we watched, the male goldfinch flew down, perched atop an alder, and gave several bursts of short-song. Suddenly we spotted movement through the alders. We watched intently. It was the female! We could tell by her muted colors and lack of a black patch on her forehead. We lost sight of her when she flew into the shrubs, but she soon returned.

The trips back and forth meant that she was fetching nesting material or food for nestlings. Before she disappeared again among the alders, we caught a glimpse of some long strands in her bill, and when she left we saw that it was empty. Now we knew she was building a nest right in front of us.

We noted that the female was using strands of bark from old milkweed stalks, stems of maple seeds, and the dispersal filaments from a wildflower as nesting material. However, we were surprised when we saw her fly to an ash tree where there was a web nest of fall webworms. She fluttered her wings in the webbing, then flew to her nest where she carefully pulled pieces of it off her wings with her bill and applied them to the nest.

Goldfinches nest late in summer, well after most other songbirds. Some people have suggested this is because the bird depends on thistle down for its nest and thistles do not go to seed until late summer. We have observed the birds using a variety of materials, however, leading us to believe that goldfinches do not depend on thistle alone. A better explanation of their late nesting may be that they need an abundance of seeds to feed their young. Most songbirds feed insects and fruits to their young, but goldfinches feed their chicks a regurgitated slurry of partially digested seeds. They especially favor seeds from composite flowers, such as thistle and sunflower, which are not mature until late summer.

Over the next few weeks we returned many times to the nest. It was finished in four days and for several days after that the pair disappeared from the territory. This is typical in goldfinches. Perhaps the repeated trips to the nest during building make its location known to predators, such as cowbirds, jays, or raccoons. However, a potential predator may lose interest and forget about the nest if the goldfinches leave the area for a while before egg laying.

After this absence the female returns on successive mornings, laying one egg each day until the clutch of four or five eggs is complete. The female goldfinch does all the incubation and is more constant than other songbirds. One study showed that she can remain on the nest 95 percent of the time. In most other species the female leaves the nest to feed on her own, but male goldfinches supply mates with almost all of their food.

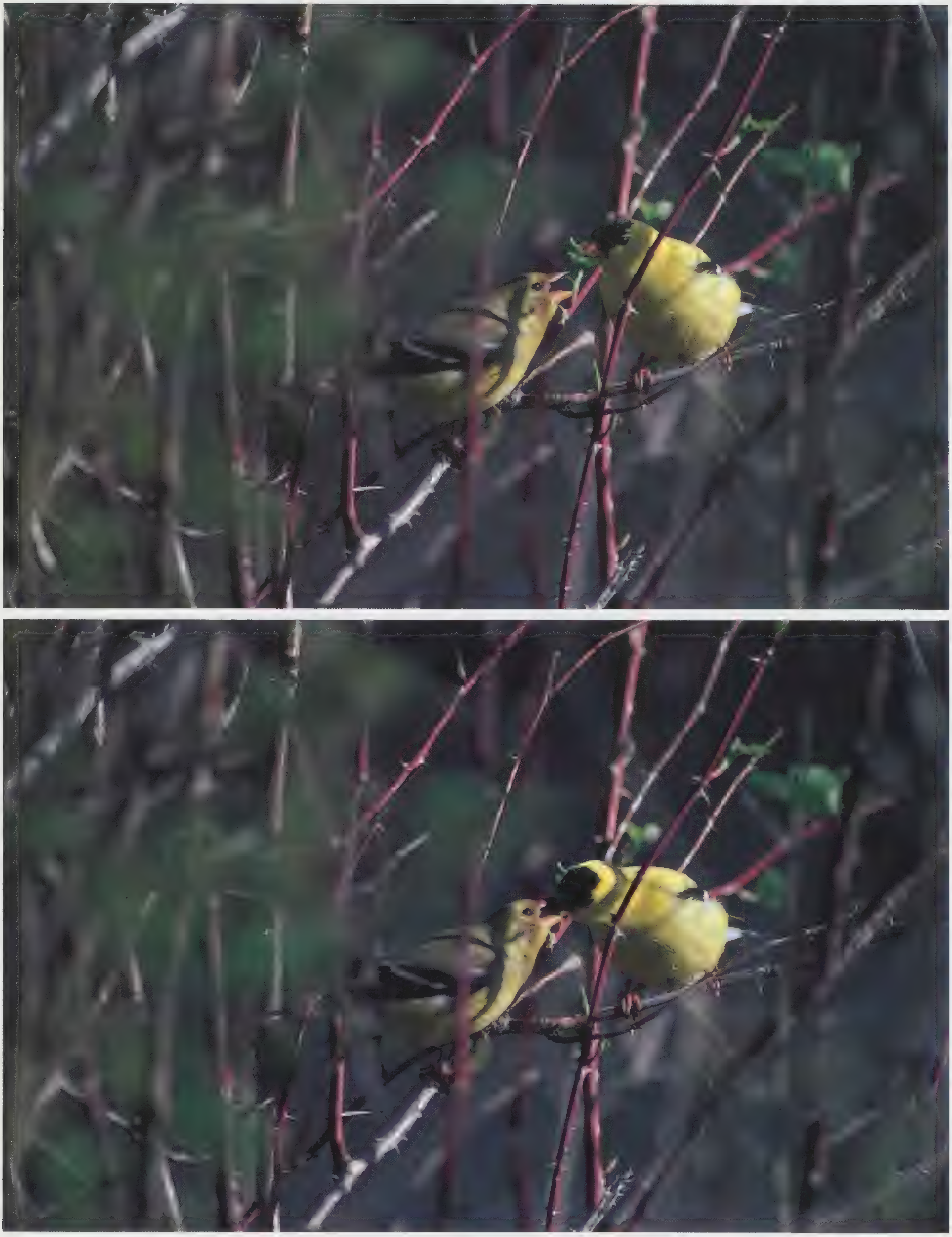
The male, who often leaves his territory to feed, flies back to the nest site, and circles high above it giving the flat-flight display or a deep-loop-flight display, where the bird's normal flight undulations are exaggerated. At the same time he may give bursts of short-song. If the female is hungry, she calls *teeteeteeteeteetee.* When the male hears this he drops down near the nest, the female hops over to him, and he regurgitates food into her mouth. The male returns every hour or so and if the female does not call he leaves and comes back later.

After the young have hatched, both parents feed them regurgitated seeds. When the parents leave the nest sometimes they carry a white blob called a fecal sac in their bill. At this stage in the nestlings' life their droppings are encased in a membrane which the parents take away to keep the nest clean. When the nestlings are about to fledge they stop producing fecal sacs and instead defecate over the edge of the nest. Thus, a goldfinch nest with droppings around the rim probably means the nest was a success and the young have departed.

The calls of fledgling goldfinches are distinctive. They sound like *chipee, chipee, chipee* and are given as the birds fly after their parents demanding food. When we hear the calls, we know that soon the asters will be blooming and the leaves will be turning color. After most other birds have finished nesting and are preparing for migration, the goldfinches are a bright spot for the behavior-watcher. They give us one more chance to follow the fascinating behavior of breeding birds.

—Donald & Lillian Stokes

Donald and Lillian Stokes are authors of the Stokes nature guides which include *A Guide to Bird Behavior,* Vols. I and II.



TOM MANGELSEN (2)

When the male hears *teeteeteeteeteetee* he regurgitates food into his mate's mouth.

ARTIST IN THE WILD

DONALD LUCE

THE coast of Peru, 1925: an artist is intently sketching seabirds—guanay cormorants, Peruvian boobies, and pelicans that nest there by the millions. He had tried but abandoned his oil paints; the wind vibrated the canvas, and the feather flies that drift above the colonies in clouds stuck to the paint. Instead, he works in pencil, carefully noting the birds' color patterns and defining their form with strong, sure lines. These sketches will form the basis of a series of paintings illustrating what has become a classic work, Robert Cushman Murphy's *Oceanic Birds of South America.*

***Peruvian Bird Group*, pencil, 17 × 15, 1935. Jaques, above, visited coastal Peru and sketched the barren, rocky headlands of South Chincha Island, capped with thick deposits of dried guano, dazzling white in the hot tropical sun.**

Though alone and on his first expedition for the American Museum of Natural History in New York, Francis Lee Jaques was experienced in fending for himself. Having grown up on isolated farms in Kansas and Minnesota, Jaques knew the value of self-reliance. As a young man, he worked as a lumberjack, taxidermist, railroad fireman, and electrician, and often explored by canoe the wilderness of pine forests, lakes and rocky shores along Minnesota's northern border. Through all these endeavors, he maintained a passion for drawing, particularly birds.

As a boy on the Kansas prairie, Jaques often hunted waterfowl with his father. The ducks were food for the family, but Jaques was not insensitive to their beauty. He made many detailed drawings of the birds in charcoal and chalk. Once he kept a pair so long while doing a drawing, they spoiled. Even at this early age, Jaques was fascinated by the flight of birds and impressed by the great flocks of migrating geese that filled the sky with wavy lines and Vs.

After the family moved to Minnesota, Jaques was given more responsibilities and finding time to draw was not always easy. Jaques recalled that he and his brother were given the task of spading the garden. There was only one spade, so they took turns. "Spading a garden is a boring process, but there were birds, and I watched birds, and between heats drew birds."* Now in his late teens, Jaques taught himself to use watercolors and produced a series of paintings of wildlife through the seasons. In looking at his painting of hooded mergansers from this period, it is easy to see how Jaques could have developed a passion for birds. In this cold, bleak scene of early spring, two small ducks stand out as the only sparks of life, harbingers of the season to come.

After his army service in World War I, Jaques took informal art lessons from a painter friend in Duluth. He also took a job as an illustrator for a photo-engraving company. He did pen and ink drawings for advertisements and catalogues. "Our work was labels, toilet paper, match boxes, lettering, dozens of drawings of useless devices to make a Model T Ford run better or to hold it together." Though the subjects left much to be desired, the experience developed his innate ability to draw. Eventually he realized his true calling was to paint birds and nature. Recalling a museum exhibit of mule deer he had seen in San Francisco during his army training, he decided to apply for work at a museum.

So in 1924, at the age of 37, he sent a painting of black ducks to the American Museum with the hope that they needed an artist. There was little chance that the museum would even consider an obscure illustrator from Minnesota with no academic training in either ornithology or art. Yet his painting was beautiful, accurate and strikingly different.

The prominent bird artists of the day such as Louis Agassiz Fuertes were schooled in the tradition of John James Audubon. Their objective was ornithologically accurate descriptions of feather and other surface detail. Fuertes had a remarkably thorough under-

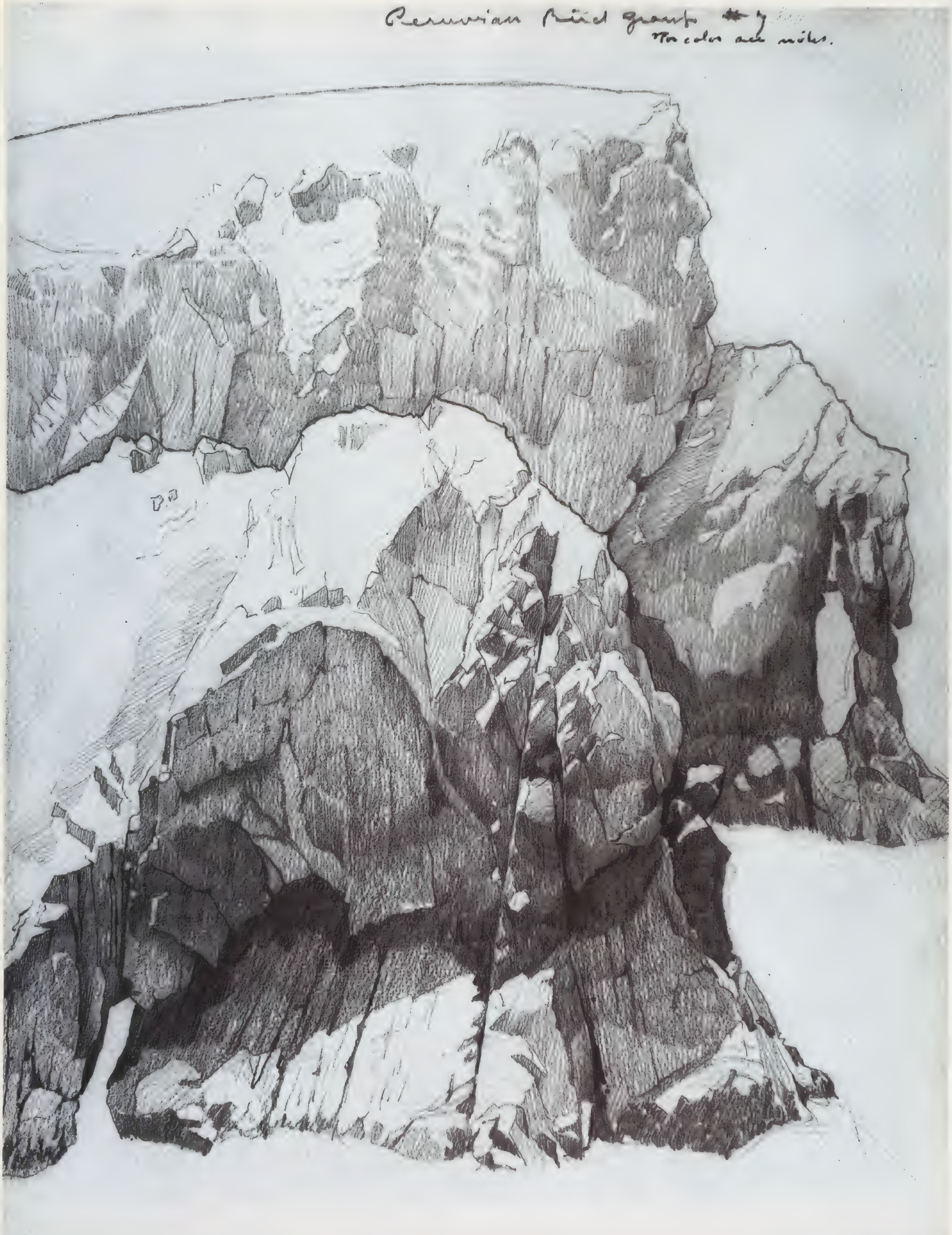

Peruvian Bird group #7
The colors are notes.

PHOTO: CALIFORNIA ACADEMY OF SCIENCES. DRAWING: BELL MUSEUM OF NATURAL HISTORY.

***Swans over Tundra*, oil on canvas, 30 × 42, 1928.**

Jaques sketched and painted birds in flight as he knew them in the field. He was sensitive to the patterns of birds against the sky and captured on canvas the flight characteristics of each species. In Alaska this pair of whistling swans emerged over a salt marsh. Right, a detail from a pencil sketch of black ducks.

***Taipee Valley*, Nuka Hiva Island, Marquesas, oil on canvas, approx. 20 × 45, 1934.**

After an arduous climb to the top of this ridge, Jaques knew he could not return with painting equipment. Instead, he took photographs and painted this three-part panorama on board the schooner *Zaca*.

DONALD LUCE

standing of birds—his subjects are perfectly structured and display the subtle postures and gestures characteristic of each species. Fuertes was at his artistic best in close-up portraits that seem to capture the very essence of the living bird. However, his birds are almost always at rest, with little or no background landscape.

Jaques, on the other hand, painted birds in flight as he knew them in the field. This was well before high-speed photography, and few artists could convincingly portray birds in flight. Jaques was sensitive to the movement and pattern of single birds or flocks against a sky, and captured on canvas the flight characteristics of each species. Jaques' abilities, though far from fully developed, were evident in that first painting sent to the American Museum. Dr. Frank Chapman, curator of ornithology and one of America's leading ornithologists, was so impressed that he invited Jaques to join the staff.

Soon after his arrival, Jaques traveled with Chapman to Panama to collect material and make sketches for a tropical rain forest exhibit. While in Panama, he was chosen to illustrate Murphy's book, and since he was already halfway there, he was sent on to Peru. "This required an emergency passport, money, which I carefully wasn't given much of, and 'instructions.'" Thus, less than a year after leaving the familiar forests and prairies of Minnesota, Jaques found himself on the guano-covered rocks of Peru's bird islands.

He was fascinated by the headlong dives of Peruvian boobies. He sought out Inca terns on cliff ledges and Peruvian penguins in wave-washed sea caves. Though enamored of the birds, their environment impressed him even more so, particularly the contrasts of this bare and rocky coast. Offshore, anchovies swarmed by the trillions in the cold, nutrient-rich waters. Feeding on these fish, seabirds flourished, nesting in vast colonies on islands along the coast. Rain, however, was extremely rare and the shore itself was barren. Jaques later wrote:

> "Looking shoreward across Independencia Bay, miles away with the glasses, was a great gentle slope of gravel. Nothing has ever grown there, nothing ever lived there, and across the whole mountainside is a criss-cross pattern of lovely tracks. Whose tracks? Why? How many years have they been there? Nothing has ever left me so mystified, they seemed so small in time and space. I was grateful I knew something of this coast before I came. Nowhere on Earth is there anything to equal it. Nowhere else is life so abundant and death so obvious."

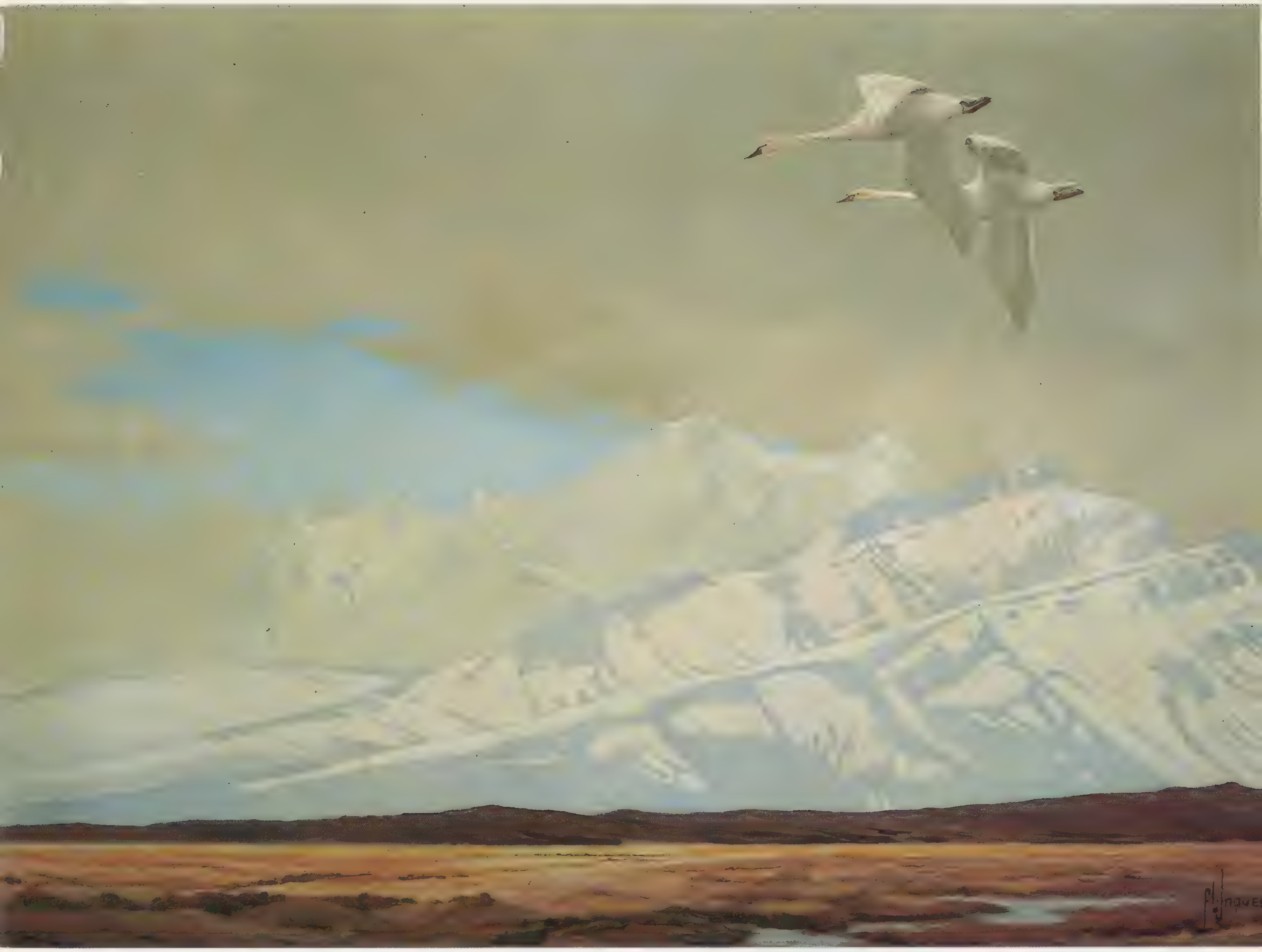
Jaques' interest in landscape as well as birds proved to be a great asset in creating innovative habitat exhibits that were transforming natural history museums. The old museum exhibits consisted of heavy cases crammed with taxonomically arranged specimens. These cases were descendants of the ancient curio collections and represented an earlier stage of natural science, one strictly concerned with describing and cataloguing nature's diversity. With the growth of evolutionary theory and the rise of the conservation movement in the early 20th century, science and public attitudes toward nature were changing. Naturalists were recognizing the importance of habitat and were seeking the underlying relationships that produced nature's diversity.

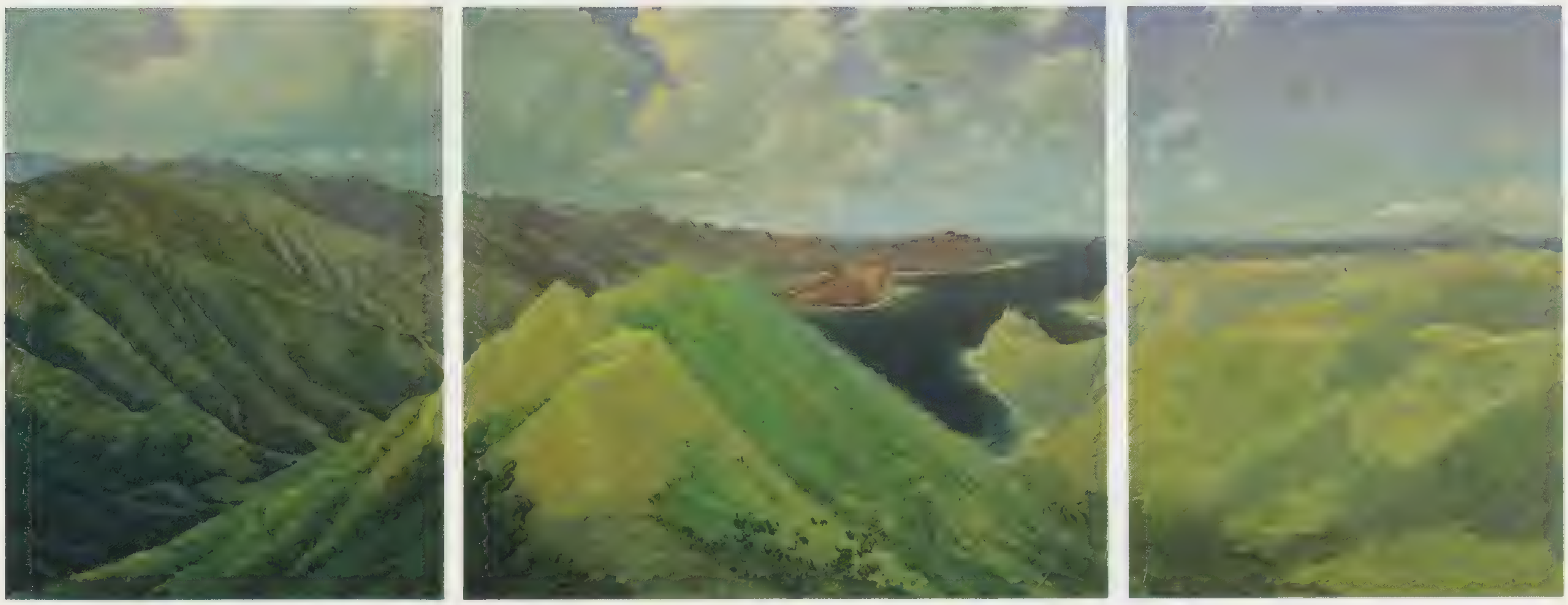
This change in science combined with growing urbanization called for new ways of bringing natural history to the city dweller. Chapman was a great popularizer of natural science and conservation, and promoted the replacement of old museum cases with habitat exhibits. These exhibits recreated natural scenes with their characteristic plants and animals displayed against a curved background mural. In viewing the new exhibits, visitors could glimpse the diverse plant and animal communities from all over the world.

To gather material and make sketches for these exhibits, Jaques traveled not only to Panama and Peru, but to the Bahamas and Europe. He joined museum expeditions to the arctic in 1928 and the South Pacific in 1934–35. Transportation in Alaska and the Pacific was by schooner, still practical for long voyages in remote waters where fuel and supplies were hard to come by. Jaques' principal responsibility was to take photos and make sketches and paintings for later reference in composing background murals and bird illustrations. He also collected bird and mammal specimens and took samples of rocks, soils, and plants. In Panama, for instance, he did many detailed drawings of tropical plants and collected the entire lower trunk of a strangler fig tree.

Jaques' environmental concern is a hallmark of much of his art. Where other artists merely suggested a bird's habitat by placing it on a sprig of vegetation, Jaques painted birds and other animals into landscapes. Rarely are these landscapes just backdrops for

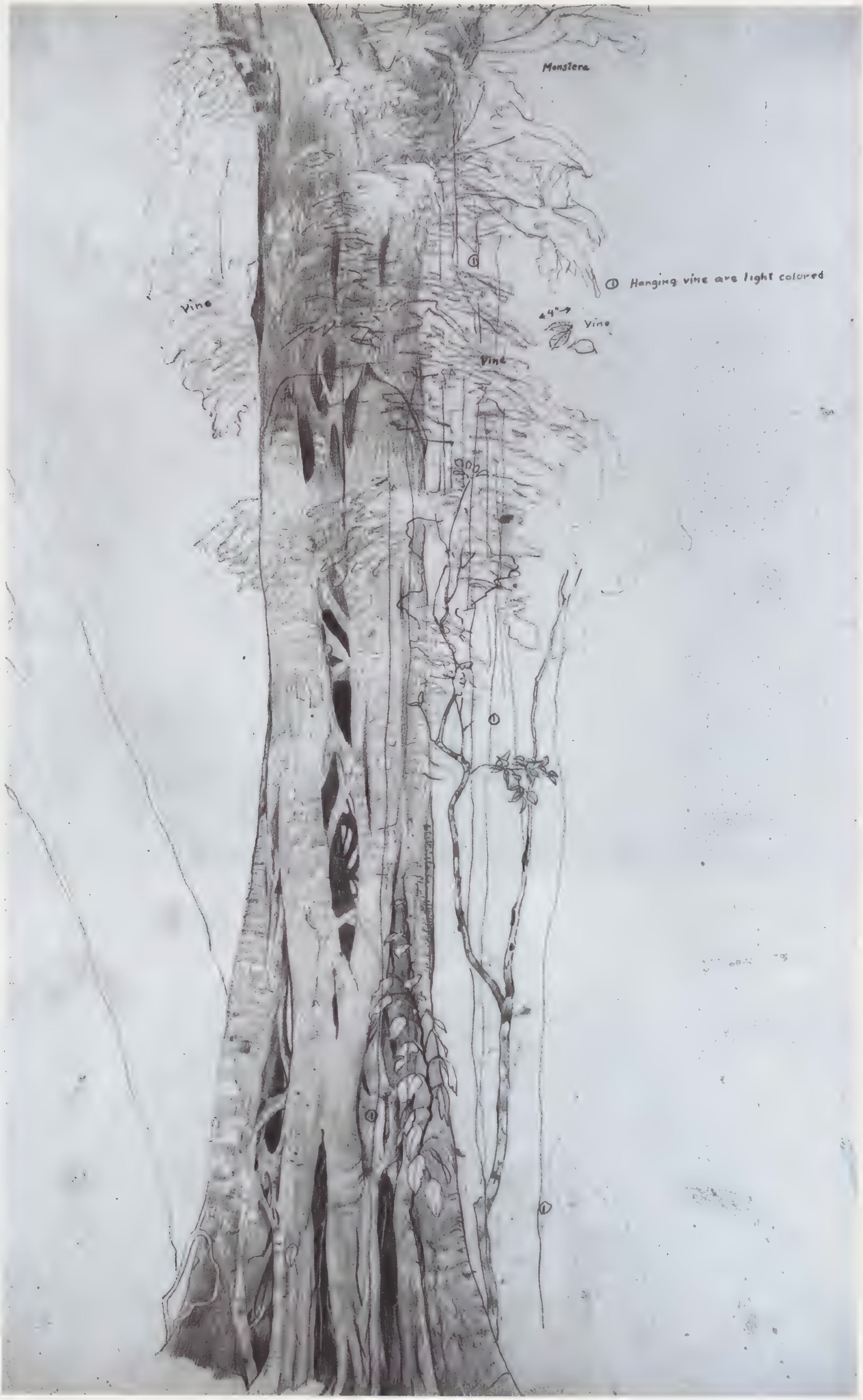
BELL MUSEUM OF NATURAL HISTORY





AMERICAN MUSEUM OF NATURAL HISTORY

Strangler Fig Tree,
Panama, pencil,
18 × 12, 1925.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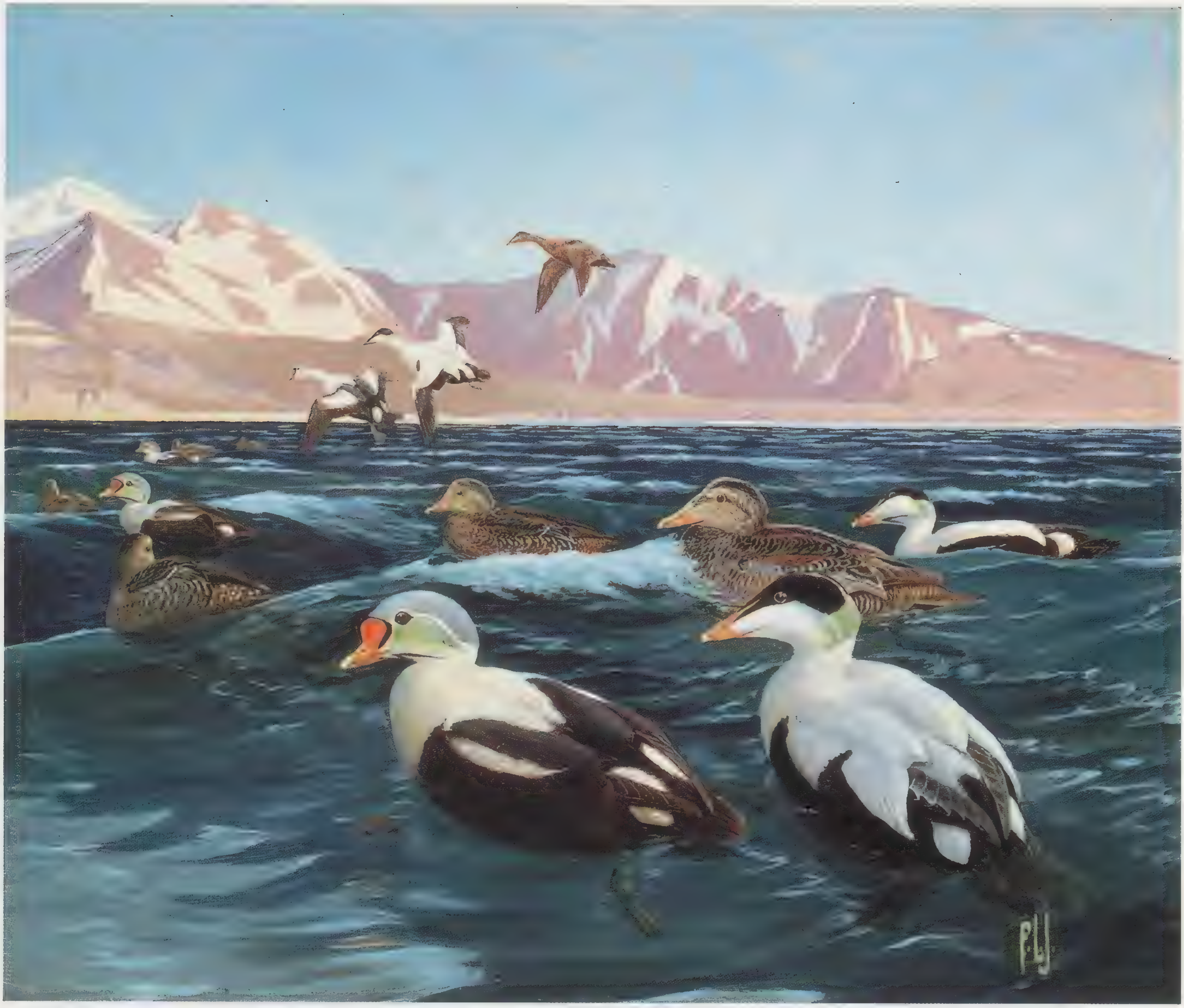
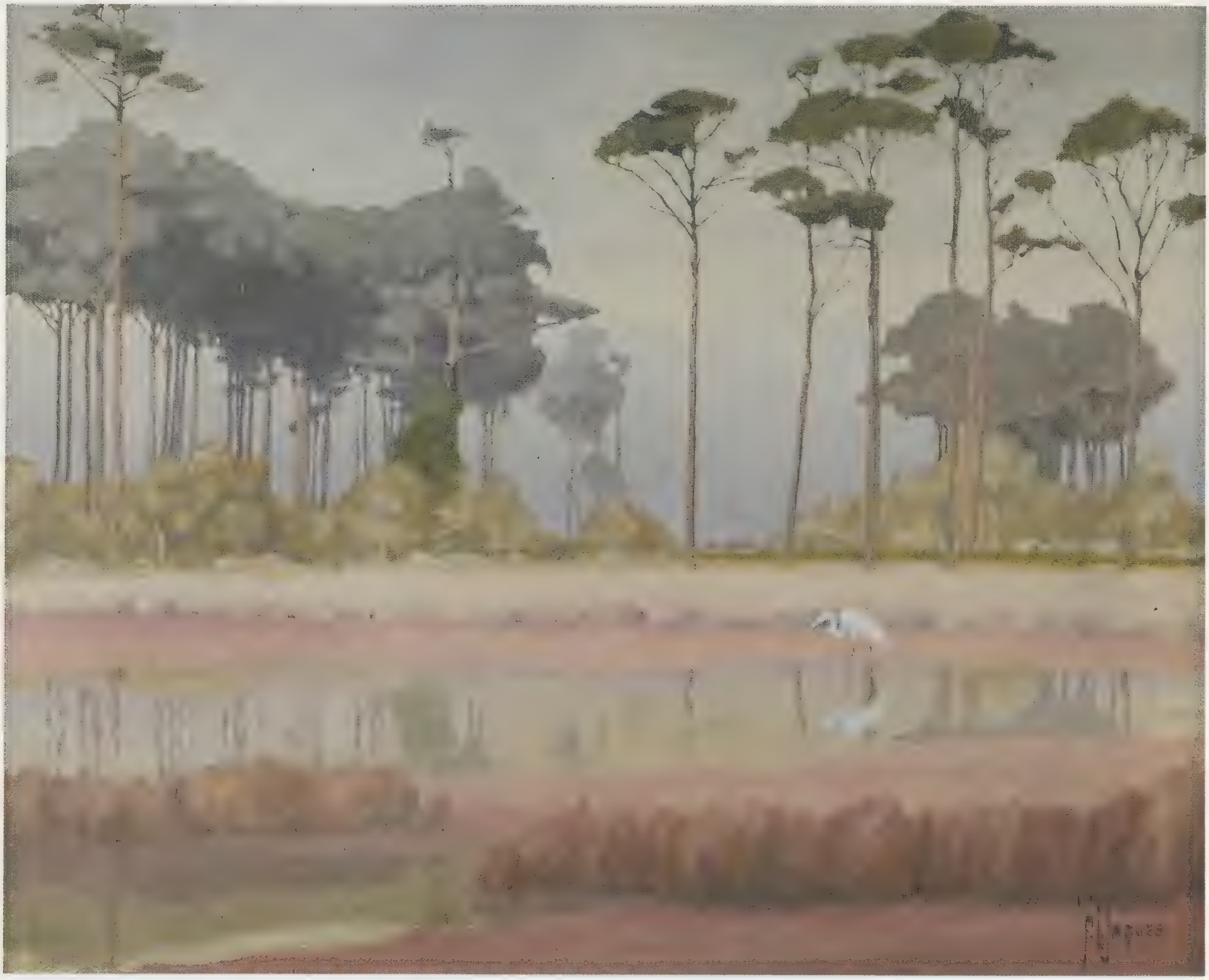


BELL MUSEUM OF NATURAL HISTORY

CALIFORNIA ACADEMY OF SCIENCES

***Eiders off Alaskan Coast*, casein, 20 × 23, 1928.** Jaques traveled by schooner to reach remote and inaccessible regions of the globe. These king and common eiders were painted on board the *Morrissey* during an expedition to the arctic. Left, Jaques on board the *Zaca*.



BELL MUSEUM OF NATURAL HISTORY

***Egret in Florida Pond*, oil on canvas, 24 × 28, c. 1935.**

the animal subject. Instead Jaques showed the interdependence of animals and their environment.

For example, in *Egret in Florida Pond*, the bird is stalking its aquatic prey at the water's edge. This alone would be a fairly obvious statement about the egret and its habitat. However, the painting is rich in subtle meaning. With his distinctive use of color and light, Jaques lets us sense the heat, humidity and stillness of the morning air. The southern pines, understory shrubs, grasses and red mud are beautifully described, but not through the use of detail. Rather, Jaques distills each subject to its essential forms. These forms, like pieces of a puzzle, are fitted together into an integrated composition. This integration, which characterizes a Jaques painting, echoes the interaction of plants, animals and their environment in a living ecosystem.

Jaques was painting the wilderness landscape from the ecological perspective long before concern for the environment was commonplace. His depiction of birds in flight, particularly waterfowl, and his combination of bird and landscape painting, foreshadowed some of today's successful wildlife artists, such as Robert Bateman. Though well known and respected by many naturalists and artists of his day, Jaques never gained the recognition of Fuertes or Roger Tory Peterson. He was an intense but reserved person who shunned the spotlight, and his death in 1969 at age 82 came before wildlife painting gained its current popularity and commercial success. Yet Jaques' work has an authenticity often lacking in the works of modern wildlife painters, and his art remains a beautiful expression in visual form of a profound ecological consciousness. □

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*All quotes from Jaques' unpublished autobiography.

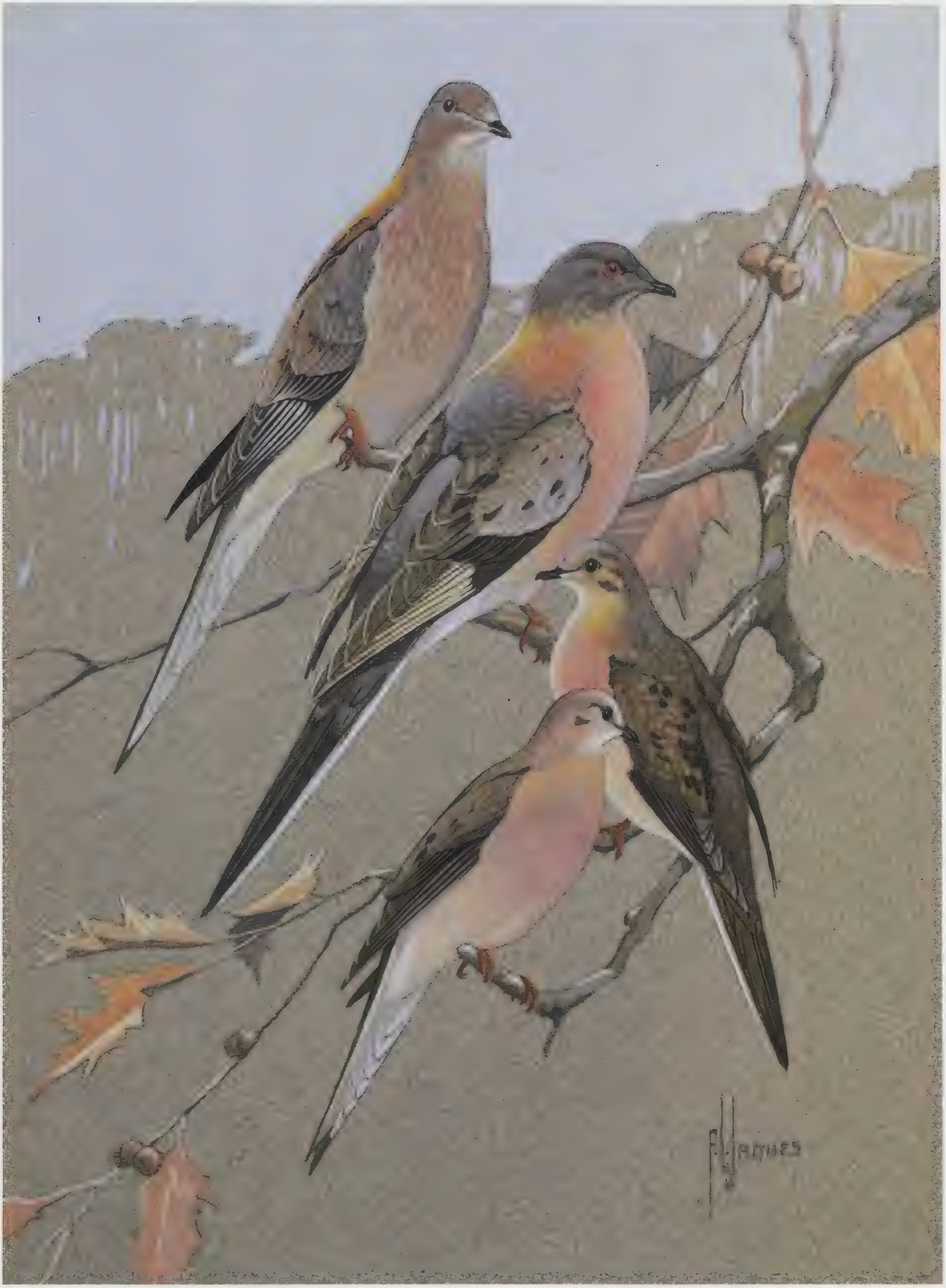
Donald Luce is assistant curator of exhibits, Bell Museum of Natural History, University of Minnesota, Minneapolis.

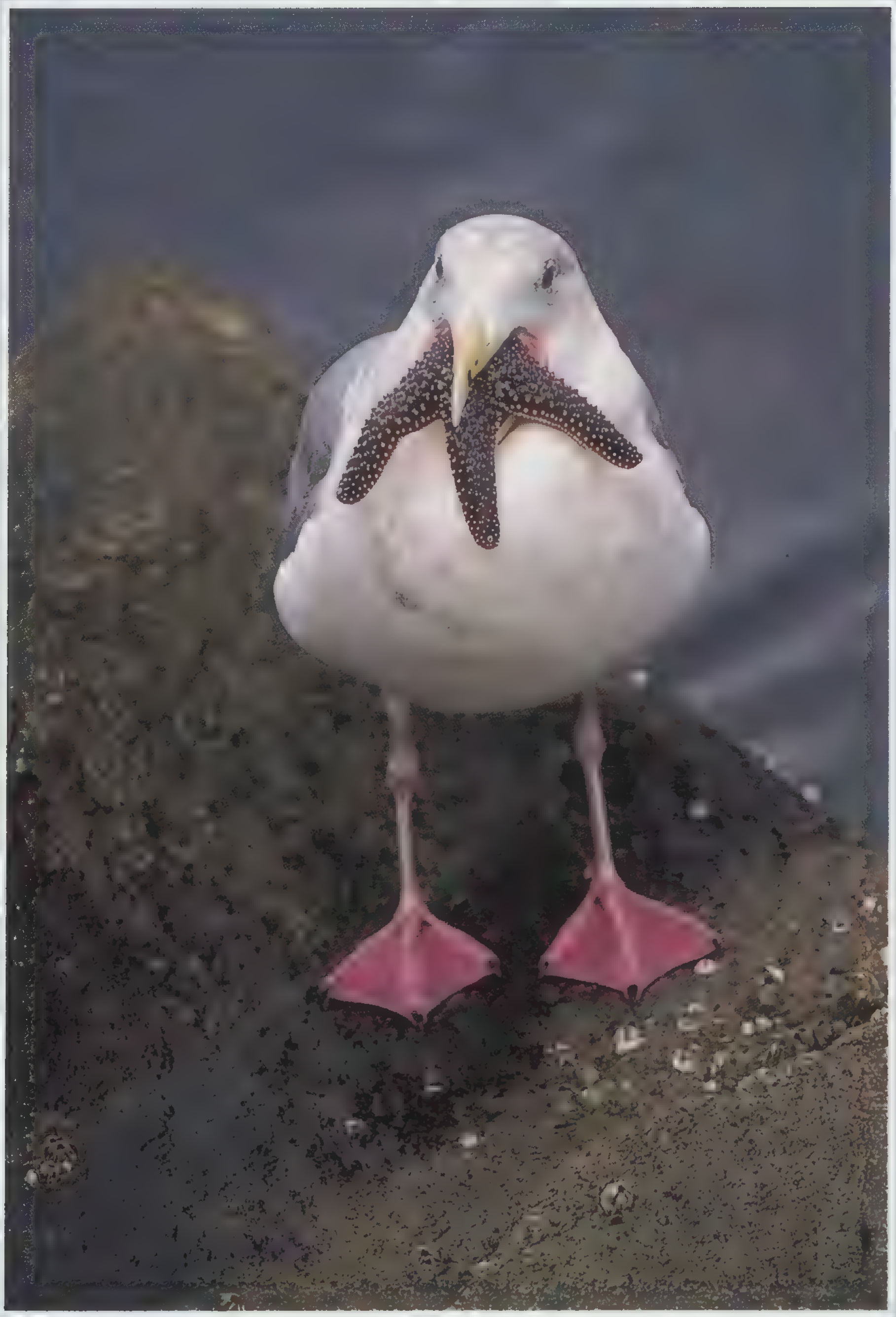
Further Reading

Jaques, Florence Page. *Francis Lee Jaques: Artist of the Wilderness World.* Doubleday & Company, Inc., Garden City, New York. 1973.

Luce, Donald T. and Laura M. Andrews. *Francis Lee Jaques, Artist-Naturalist.* University of Minnesota Press, Minneapolis. 1982.

Murphy, Robert Cushman. *Oceanic Birds of South America,* Vols. 1 and 2. The American Museum of Natural History, New York. 1936.


F.L.Jaques



THE LIVING BIRD

Quarterly

Autumn 1986

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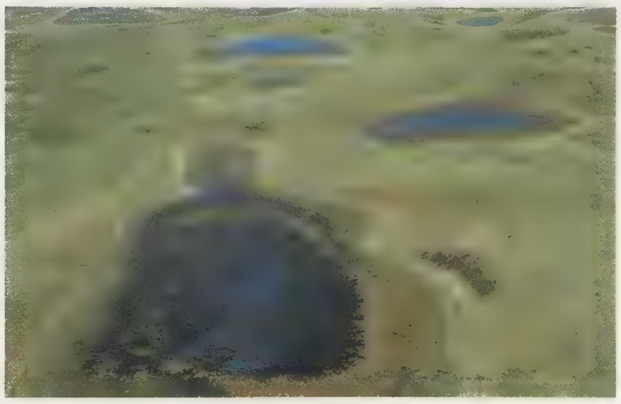
Peter Kilham took a few washers, a piece of plastic tubing, and some scrap metal, and turned them into a bird feeding revolution.



p. 6 Depression in Dakota

Front Cover: Outside–The snowy egret lives around fresh, brackish, and salt water where it eats small fish, frogs, lizards, snakes, crabs, and other aquatic prey. The bird uses one foot to stir the bottom of shallow ponds and marshes to frighten prey into view, then stabs the victim with its bill. Photograph by Tim Fitzharris. Inside—Earl Dibble and Magellanic penguin on an island in the Straits of Magellan. Photograph by Earl Dibble (Photo Researchers, Inc.). **Back Cover:** Outside–Swainson's hawk giving a curious look in New Mexico. Photograph by Marty Cordano. Inside–Peafowl. Attributed to Mansur, Mughal, India, ca. 1610. Private collection.

Listening and Learning

When I was still just a neophyte birder 25 years ago, I read Roger Tory Peterson's *Birds over America* and learned about May Big Days—those mad expeditions on which one chases birds for up to 24 hours at a stretch, trying to find as many different species as possible. Century Runs they were called in New England in those days, because the species totals could be a hundred or more. With visions of huge lists of wonderful birds dancing in my head, I talked my birding mentors, my father and my uncle David, into going on a Century Run in Massachusetts.

At about 4 o'clock on the morning appointed, we drove slowly out onto the state road—just coasting, really—with the convertible top down and the dawn concerto well into its first movement. Immediately Dad and Dave began pointing into the darkness in all directions, calling out the names of singing birds: "Yellow warbler." "Rose-breasted grosbeak." "Song sparrow." "Scarlet tanager." "Least flycatcher." "Swamp sparrow." "Chestnut-sided warbler." "Wood thrush." Hey, no fair! How on Earth did they do that?

How they did that, of course, had to do with decades of experience, hundreds of chases after unfamiliar bird songs, and some help along the way from birders who knew more than they did. I had a lot of that learning process still ahead of me.

Today's generation of birders has an advantage from the start that my father and uncle did not—a large and growing library of commercial audio recordings through which experienced birders may give us the benefits of their knowledge. Some of these records are aimed at beginners, and they offer only limited selections. For example, one of the earliest, "Songbirds of America," produced by Houghton Mifflin and the Federation of Ontario Naturalists in 1954, comprises the songs of 24 common birds, accompanied by a text, photographs, and a simple narrative.

Others are in effect general reference works, with many bird species represented. The Peterson-Houghton Mifflin record series, which complements the Peterson eastern and western field guides, offers vocalizations from several hundred birds, including some Hawaiian species.

Still others concentrate in detail on groups of birds, or even on a single species. Among these is the delightful and mysterious "Voices of New World Nightbirds"—owls, nightjars, and the like, compiled by John William Hardy.

As it turns out, these recordings have a variety of practical uses besides teaching us to identify birds by ear. They can help a fellow get tuned up for Big Days, and that's a plus. In the field, playing taped songs can coax birds, in defense of territory, out to where you can see them, or may stimulate them to sing. And the recorded calls of eastern screech-owl and saw-whet owl in daylight can draw quite a varied crowd—mostly small songbirds that come to scold the owl, but now and then I've also seen a red-tailed hawk drifting over, apparently looking for what might make an easily caught meal.

I must say, I have some philosophical and moral doubts about using recordings as bird-attracting aids. Each time I do it, I am aware that I am interfering with birds' normal routines. There is also plenty of evidence that repeated artificial intrusions by invisible competitors during the breeding season can actually push a bird off its territory. On the other hand, where would I be, I wonder, without a horribly hissy and scratchy re-re-re-recording of the eastern screech-owl cut on the Peterson-Houghton Mifflin eastern birds record, to bring the chickadees and hermit thrushes and brown creepers into view during Christmas counts?

Immediately Dad and Dave began pointing into the darkness in all directions, calling out the names of singing birds: "Yellow warbler." "Rose-breasted grosbeak." "Song sparrow." "Scarlet tanager." . . . Hey, no fair!

In any case, these bird-finding uses aren't the greatest rewards the recordings offer me. I've discovered that the main attraction is what you might call "music appreciation." A prime example is "Voices of the Loon," a record devoted solely to the common loon, produced in 1980 by the North American Loon Fund and National Audubon Society. The classical-music "deejay" Robert J. Lurtsema narrates on one side of the record, giving a short course on the wails, tremolos, yodels, and hoots of loon music. The loons sing by themselves (accompanied by various sounds of nature) on the other side.

You and I may now and then hear common loons calling—along a lake shore at night, say, or overhead during migration. But relatively few of us ever hear a full loon concert, ringing with long echoes, on one of the northern wilderness lakes where the loons nest, and when we do hear loons calling in nature, they are usually far off, so we don't hear them really well. A presentation that edits and arranges an array of distinct, close-at-hand calls and provides a knowledgeable interlocutor to explain the fine points of the concert can enrich our images of a bird species—allow us to learn things about it that we would never find out on our own.

Not all recordings offer as much interpretive help as they might. The Peterson sets, for instance, simply identify songs and calls. Some of the older recording productions, such as "Songbirds of America," "Dawn in a Duckblind," and "Birds on a May Morning," which were made in the 1950s and '60s and are still available, do somewhat more, but they now seem quite funky, rather

DOUG WECHSLER

What kind of bird is singing in this California buckeye tree at Point Reyes National Seashore—a song sparrow, an American goldfinch, or maybe a yellow warbler? If you knew its song you could identify the bird without seeing it.

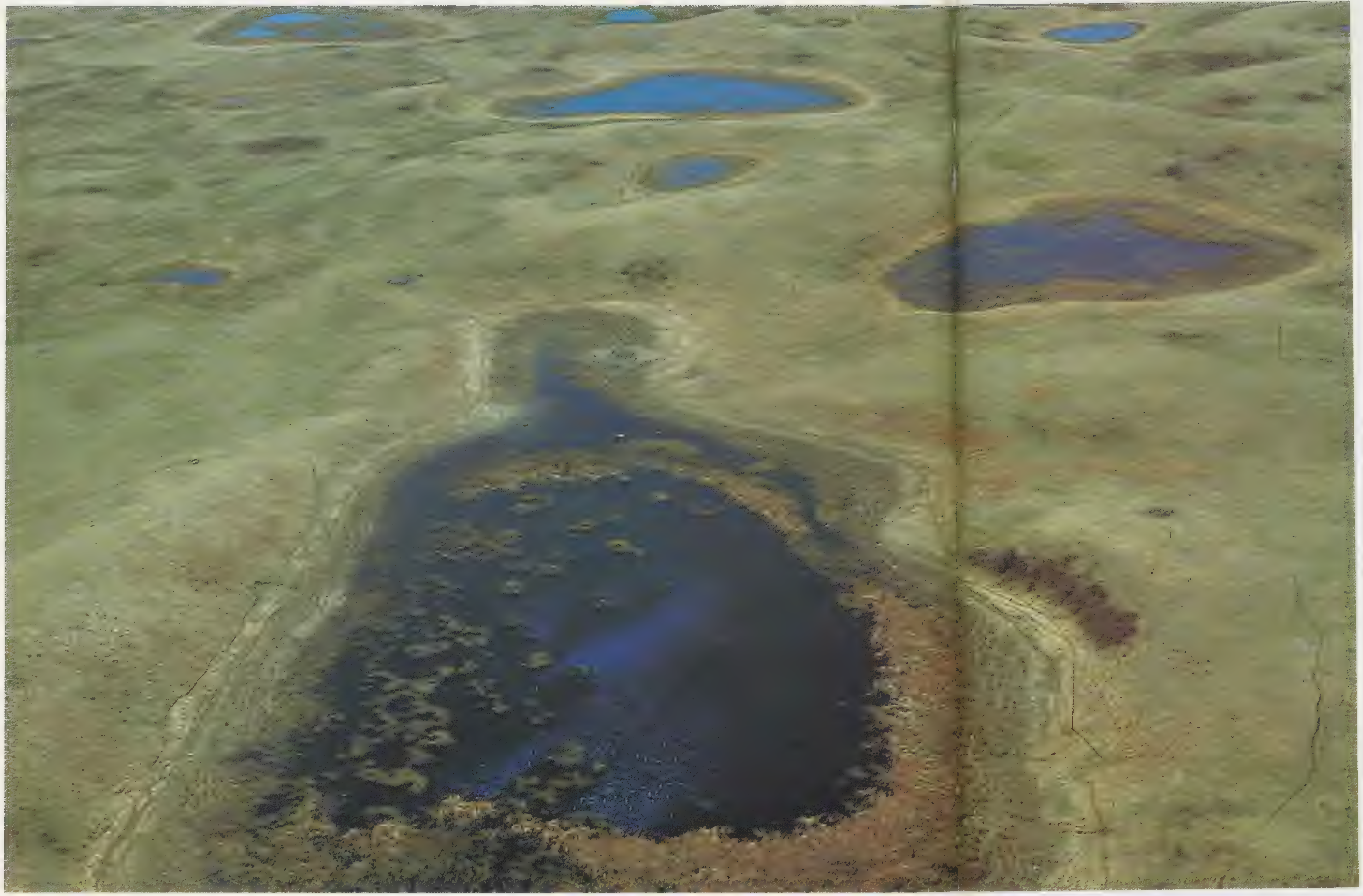
like Victorian valentine cards—the "come with us on a poetic bird walk" approach. Each of those styles has its place, and the bird songs are always interesting to listen to. But to me the best audio productions, which do the most to expand my ability to listen to bird song, combine detailed accompanying texts and a varied selection of examples for each species presented.

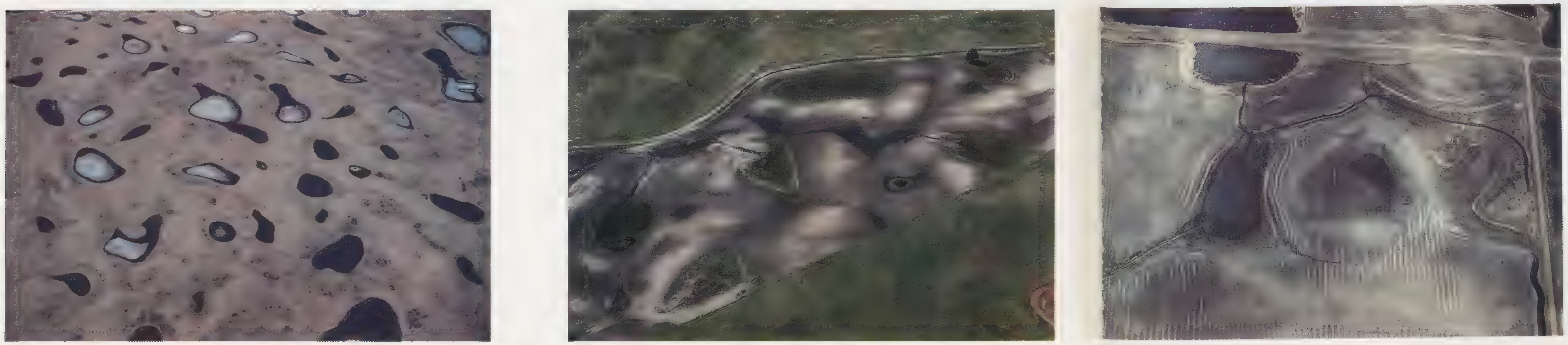
I particularly admire the work of Donald J. Borror in that respect, and by far the best of the bird song-recording productions he's been associated with is the "Warblers of North America," recorded by Borror and the late William W.H. Gunn and produced last year by the Cornell Laboratory of Ornithology in association with the Federation of Ontario Naturalists. Each of the 57 species of wood warblers that occurs north of Mexico is represented by several different examples of songs—usually four to six of them—and call notes are included for 48 of the species. The 50-page booklet includes information about the recordings themselves and a key to the identification of warbler songs, but mostly it comprises 57 species accounts of songs and calls. The only illustrations are sonograms.

Until I saw the "Warblers" booklet, I didn't think highly of sonograms, having met them mainly in miniature in the margins of the Golden field guide to the birds of North America, where they did nothing for my understanding or knowledge of bird song. But here they are presented larger on the page than a life-size warbler, and I can now see why ornithological audio specialists find sonograms so fascinating. Reading the charts of familiar species while listening to recordings of their songs has led me to notice things I never would have paid attention to otherwise—for example, the surprisingly wide ranges in pitch within many songs, and the rests between notes in rapid passages—pauses we can't hear because the songs go past us so fast. I believe if I listen to warbler songs and read sonograms for a while, I'll begin to hear all birds in a new way.

That's a good project. And with winter coming, and so many birds gone south or gone silent, what better time to put a recording on the machine and sit by the stove, to listen and learn?

—Michael Harwood





JOHN SIDLE (4)

Wanted: Dakota Ducks

JOHN G. SIDLE

If ducks were engineers, they could not have designed better breeding habitat than the prairie pothole region of America's northern great plains. Among the fields of prairie grasses lie millions of small ponds, marshes, swamps, and kettles—ideal terrain for the care and feeding of young waterfowl.

The pothole region comprises 300,000 square miles and contains parts of Iowa, North Dakota, South Dakota, Minnesota, Montana, and the prairie provinces of Canada. For 10,000 breeding seasons this area has attracted millions of nesting ducks and fledged new flocks which disperse to inhabit much of the western hemisphere. Called North America's duck factory, the region constitutes only 10 percent of the continent's waterfowl breeding habitat, yet it produces 50 percent of all ducklings hatched in North America each year.

These remarkably fertile wetlands also supply food for millions of birds as they migrate south each fall and back to their breeding grounds in spring. Shorebirds returning to Hudson Bay from South America peck for invertebrates at pothole shores, and tundra swans from Chesapeake Bay stop on Dakota ponds before heading for the arctic.

Unfortunately for breeding waterfowl and migratory birds, the potholes are in the middle of some of the most productive farmland on the continent. Farmers drain the potholes of water, and plant wheat, sunflowers, and other crops on the newly exposed soil. At present, over half of the original prairie potholes have been drained for wheat production, and duck populations that breed in the region are declining. In the autumn of 1979, 95-million ducks left their pothole nesting grounds for winter quarters. By autumn 1985 the population numbered only 62-million, a 33 percent decrease in just six years and the lowest number on record.

During the five years I worked as a manager at the U.S. Fish and Wildlife Service's (USFWS) Arrowwood Wetland Management District in North Dakota during the late 1970s and early '80s, both family farmers and pothole ducks were going through a bust period. A lone grain elevator marked the remains of

Aerial views of prairie wetlands: top, an intact pothole; below, potholes in the midst of farmlands. The conflict between wildlife preservation and farming is not new. In 1934 President Roosevelt's Committee on Wildlife Restoration said there was "incontrovertible evidence of a critical and continuing decline in wildlife resources, especially migratory waterfowl, due to the destruction and neglect of vast breeding and nesting areas by drainage, encroachment of agriculture, and the random efforts of our disordered progress toward an undefined goal."

JOHN GERLACH

GARY R. ZAHM

Dabbling ducks like the gadwall, far left, feed from the surface of pothole shallows. Diving ducks such as the canvasback, below, plunge beneath the water to feed on aquatic plants. Both types of ducks suffer from wetland drainage. Left, corn stubble surrounds a pothole in South Dakota. To assist waterfowl some farmers leave stubble in which the birds can nest, instead of plowing the land black.

small towns. Many communities had died as small farms no longer turned a profit. Farming today is big business, with the typical agricultural complex averaging 1,100 acres. As a result, woodlots and fencerows have disappeared, streams and coulees have been channeled, and thousands of wetlands have been drained.

I explored the area often. On many a morning during spring thaws, my boots would sink through the damp plow furrows on the expansive farmland of the Arrowwood District. Rain and melting snow moistened the soil, and water filled the wetlands. Some potholes were just splashes of water that would soon dry up. Others were deeper, permanent, and partially covered with cattails. A tractor covered with mud waited in the fallow field. Plow furrows rimmed the wetlands and farmers soon would be planting.

Wetlands are among the last of the prairie's features to be transformed by man, but were one of the first creations of the retreating glaciers 10,000 years ago. The continental ice sheet, over one mile deep in places, attacked the land with awesome force, grinding bedrock into powder and leveling the land. At the end of the ice age the Earth rebounded and there remained a landscape of wide open plains, conical hills, and millions of potholes of various shapes and sizes.

Before the prairie was settled, great herds of buffalo roamed the infinite expanses, while huge flocks of waterfowl presented a winged spectacle of nature's abundance. Then in the mid-19th century, settlers with shovels began to make the first dent into the vast wetland acreage.

By 1938, 98 percent of Iowa's original potholes had been drained. The arrival of heavy machinery in the 1940s accelerated the pace. Half of the U.S. potholes had been drained by the '50s. Currently, over half of the five million acres of wetlands in North Dakota have been destroyed, with an estimated 20,000 new acres ditched each year.

Drainage trends are similar in the other pothole states. And full-scale drainage is under way in the prairie provinces of Canada with many areas experiencing the heavy drainage that took place in the Dakotas in the 1950s and '60s. On nature's time scale the wetlands are being eliminated in a fraction of the thousands of years it took the glaciers to create them.

JAMES BRANDENBURG/DRK PHOTO

While prairie ducks may not go the way of the buffalo, waterfowl are having increasing problems finding places to raise their young. Sixty percent of the dabbling ducks—those that nest on the ground and feed on the surface of land or water—once bred in pothole shallows. Mallard, northern pintail, gadwall, northern shoveler, and blue-winged teal hens nested on the surrounding grasses, later leading their broods to permanent water.

Today these grasslands are wheat fields, unsuitable for dabbling ducks which are forced to seek refuge elsewhere. Diving ducks also depend on prairie wetlands. Canvasbacks and redheads plunge below a pond's surface to feed, and they nest in the rushes and cattails of deep, permanent sloughs and marshes. Many of these potholes have been drained.

The disappearance of wetlands has not gone unnoticed by the federal government; however, while some agencies were set up to protect wetlands, others fostered drainage and agricultural development. In the late 1950s, for example, the USFWS began protecting potholes while the Soil Conservation Service promoted drainage. But in 1958 the government took its first major step to protect wetlands. That year Congress amended the Migratory Bird Hunting Stamp Act of 1934 to allow the government to use revenues from sales of duck hunting stamps to acquire pothole areas by purchase or easement. This program was named the Small Wetlands Acquisition Program (SWAP), and it meant that the USFWS could either buy wetland acreage outright or set up an easement whereby, in exchange for a single payment, the landowner agreed not to drain, burn, fill, or level the wetlands on his property.

Why would farmers sell land or set up easements under SWAP? Some wanted to help waterfowl conservation, others were persuaded by money. In the early 1960s many farmers were surprised to be offered money for sloughs they never planned to drain.

The purchase and easement technique for wetland conservation is more widely used in the prairie pothole region than anywhere else in the world. In North Dakota, for example, the USFWS has purchased 215,000 acres of Waterfowl Production Areas (WPAs), about 40 percent of which is wetland, and easements protect 759,000 additional wetland acres. Easements often adjoin WPAs and together they offer choice duck breeding habitat. But even one million acres of protected habitat aren't enough to support existing duck populations, and some WPAs have been degraded by agricultural practices.

Along a county road one summer afternoon, I topped a gentle rise and a large patch of grass came into view—an island struggling to maintain its integrity in a sea of tilled land. The 160-acre tract was one of 149 WPAs in the Arrowwood Wetland Management District. Black earth surrounded the lone plot; wetlands had been ditched into the WPA and strong winds had deposited soil over part of it, reducing the quality of the nesting cover.

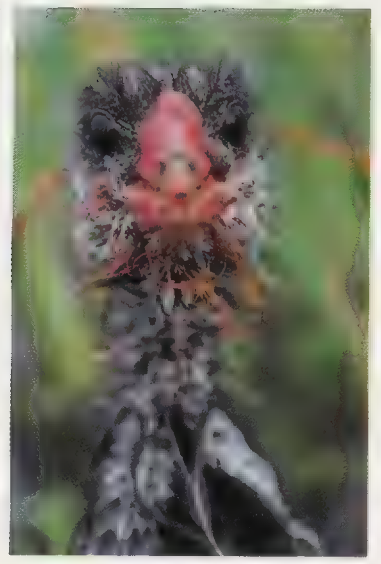
JAN L. WASSINK

I walked through the dense grass. It wasn't the original vegetation. The land had been farmed for many years prior to USFWS acquisition. Alfalfa, bromegrass, wheatgrass, and sweetclover, good duck nesting cover, had been seeded until techniques are developed to re-establish prairie flora. Occasionally, native forbs and grasses brushed my boots, sparse reminders of the sea of bluestem and Indian grass that once blanketed the region. I spotted several pairs of blue-winged teal and pintails in a section of marsh. A black tern darted over two swimming pied-billed grebes. Returning to my truck, I flushed a savannah sparrow and a nesting northern harrier.

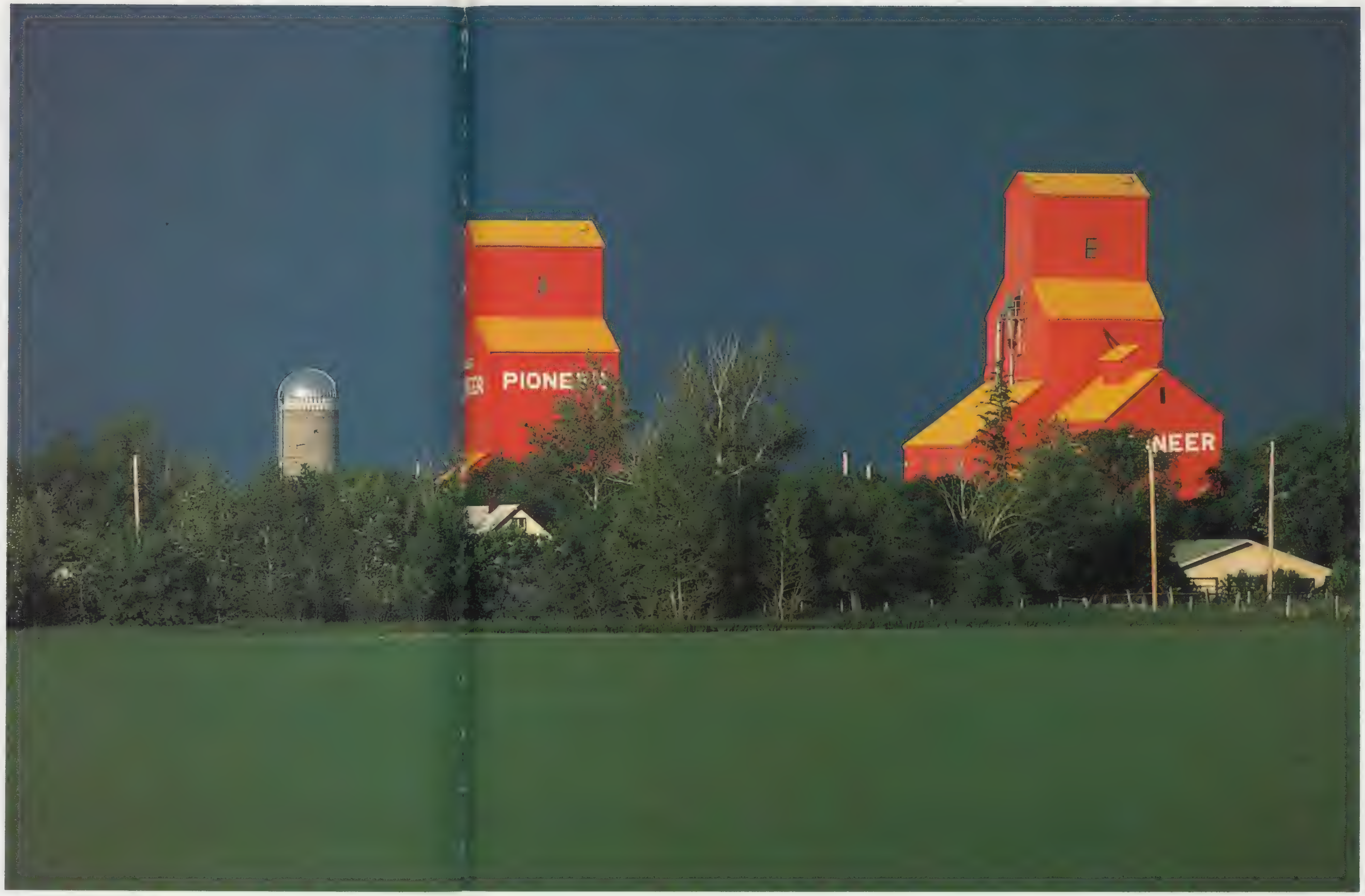
The price of drainage goes beyond lost waterfowl and other breeding birds. Emptying wetlands reduces the water-holding capacity of the land resulting in frequent spring flooding. Normally the wetlands act as great reservoirs, storing runoff, controlling erosion, and releasing water into the aquifer. But the long tradition of drainage has disrupted normal water flow. When drainage involves thousands of acres of wetlands, water dumped into rivers causes widespread flooding and poor water quality. Also, one farmer's ditched sloughs become another's flooding problem as spring thaws and rains wash out roads and culverts and inundate farms downstream.

One spring morning I pulled into the driveway of a farmstead to inquire about an easement violation. The landowner admitted to ditching several shallow potholes because a neighbor's drained wetland had flooded his sloughs. After discussing the problem we set a date for restoring the wetland by filling in ditches and removing dirt from wetland basins.

Driving along gravel roads to visit my next easement violator, I noted many ditched non-easement wetlands. The topography was nearly flat on the eastern section of Arrowwood, ideal for farming and contrasting sharply with the hillier country 20 miles to the west. Ducks and coots floated in the road ditch water, almost the last aquatic refuge for the birds in this part of the state. Grassland and other vegetation for nesting was absent except along road rights-of-way. Mallards would attempt to nest in rock piles and other odd areas, but even these habitats are disappearing.



TIM FITZHARRIS



TOM MANGELSEN

Ducks are forced into odd nesting places while crop surpluses pile up in grain elevators across the United States and Canada. The future of North American waterfowl and other species, such as the American coot, below, is inextricably linked to modern agriculture.

Although easement violations occur each year and weaknesses in the program exist, I see easements and the purchase of WPAs as two of the best solutions to the problem of disappearing habitat. Many more wetlands will have to be protected to enhance duck populations; some biologists estimate that nearly one million additional acres must be protected just to maintain duck populations at present levels.

Wetland acquisition has been difficult in recent years. In North Dakota, political opposition to SWAP has grown as the number of easements and WPAs increased and became a hindrance to water development projects. Historically, county water management boards never had to answer to the federal government when developing large-scale drainage projects. If anything, the local boards were assisted by the government. But counties began to find their projects blocked by the USFWS because the intended route of ditches and channels would pass through easement wetlands.

In 1977 the North Dakota state legislature, frustrated by federal intervention in the state's management of its water, passed laws making it extremely difficult for SWAP to continue. Later laws barred private conservation groups from acquiring habitat. Ironically, North Dakota was in the midst of a grain surplus. While many farmers offered wetland easements to the USFWS, other farmers drained land to create idle cropland so they could collect money under a federal program assigned to reduce the wheat harvest.

In 1979 the federal government finally brought suit against the state of North Dakota to have the anti-SWAP laws declared unconstitutional. The federal case worked its way through the courts for four years, winning unanimously at each level including the U.S. Supreme Court in 1983. Meanwhile, six years had passed with no new wetlands protected and acquisition offices dismantled. SWAP is under way again, but at a much reduced level. This year, however, the governor of North Dakota and the leaders of several conservation groups agreed to end the conflicts over wetland acquisition and to work toward the development of "no net loss of wetlands" policies for the state.

In the long run only the conservation of good wetlands and grasslands will preserve healthy duck populations. There is hope for the future of North American ducks because wetlands are important to more than just waterfowl. They provide habitat for many kinds of birds and other wildlife, and they help to filter water, control flooding, and maintain the water table. Perhaps prospects for Dakota ducks will improve as more people become aware of the many values of wetlands and the need to preserve them. □

John Sidle is currently a biologist with the U.S. Fish and Wildlife Service's endangered species division in Minneapolis.

Further Reading

Luoma, Jon R. "Twilight in Pothole Country." *Audubon*. September 1985.

Madson, John. "American Waterfowl: Troubles and Triumphs." *National Geographic*. November 1984.

Rudd, Clayton G., editor. *Naturalist*. Winter 1983.

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A PEDANTRY OF OWLS

ANSELM ATKINS

COLLECTIVE nouns are repositories for everyday poetry. We take pleasure in using them, though opportunities for doing so are rare. How often, for instance, do we get to say "gaggle of geese," "pride of lions," or "pod of whales"? When was the last time you mentioned a spoke of cyclists, dabble of artists, drizzle of weathermen, cut of surgeons, or fluff of ornithologists?

In any fluff of ornithologists there will be two or three who collect collective nouns for birds. Here I offer a new list which they may add to their own. It does not include every American species. Unlike the anxious taxonomist who must separate all 50 sparrows, I lumped these along with many others. I also include a few species which seldom collect, birds which can scarcely bear the sight of one another.

Five rules are at work in the formation of these collective nouns. The list is arranged to illustrate each rule.

Rule One is binding: a collective noun must be apt. It must refer to some characteristic of the bird either observable or reasonably projectable by the imagination. Examples of aptness would be—

GLOOM OF RAVENS
WATCH OF KINGFISHERS
STRIKE OF FALCONS
CLEAVAGE OF SHEARWATERS
SCRATCH OF THRASHERS
CREEP OF NUTHATCHES
FEINT OF KILLDEER
PIRACY OF JAEGERS
PROBE OF WOODCOCK
BOOM OF GROUSE
RAINBOW OF GROSBEAKS
SWELL OF PRAIRIE CHICKENS

Rule Two requires that a name be interesting. One way to be interesting is to be to the side of the mark: not inappropriate, but not exactly obvious either. An interesting combination conveys unexpected information, surprises, and provokes questions, such as—

RETREAT OF SANDERLINGS
HOARD OF GOLDFINCHES
STEALTH OF COWBIRDS
TEETER OF STILTS
ALACRITY OF PIPITS
PARLANCE OF CHAT
TINKLE OF WATERTHRUSH
PEDANTRY OF OWLS
SHOT OF REDSTARTS
APOLOGY OF SPARROWS
MONOTONY OF WILLS
REGENCY OF KINGBIRDS

Rule Three maintains that a collective noun be either short or lengthy. To be considered long, the word should have four or more syllables; short, one syllable of four or fewer letters. A few examples are—

NAG OF CROWS
PECK OF DOVES
BORE OF WOODPECKERS
CUT OF SKIMMERS
SALT OF GANNETS
EYE OF OSPREY
REGULARITY OF SWALLOWS
ARISTOCRACY OF WAXWINGS
IMPROBABILITY OF SPOONBILLS
RECRUDESCENCE OF GULLS
COMMONALITY OF CHICKADEES
RECURVATION OF AVOCETS

Rule Four states that a collective noun be tinged with poetry. The noun might catch some depth of feeling, sensuality, or penetrating insight. For instance—

AFFLICTION OF STARLINGS
FARCE OF JAYS
SPECKLE OF THRUSHES
PALETTE OF BUNTINGS
NOCTURNE OF SNIPE
ASYLUM OF LOONS
PHANTASM OF IVORY-BILLED WOODPECKERS
ELEGANCE OF TERNS
YELLOWING OF WARBLERS
PATIENCE OF HERONS
CHEER OF VIREOS

Rule Five requires alliteration, as long as it does not compromise the other rules—

PRECISION OF PELICANS
ROTUNDITY OF ROBINS
HEART OF HARRIERS
PIPE OF PLOVER
MIME OF MOCKINGBIRDS
MOTLEY OF MAGPIES
TATTLE OF TURKEYS
PRECIOUSNESS OF PUFFINS
SWEEP OF SWIFTS
WISH OF WILLETS
FLAMBOYANCE OF FLAMINGOS
SOLITUDE OF SORAS

There you have them: handy collective nouns for a medley of American birds; now you can refer to even the largest and busiest of flocks in a knowledgeable and accurate manner. I plan to provide a similar service for lepidopterists. There flies a shimmering of ringlets, a dunning of blues, a Halloween of Dianas, a wedge of skippers, a rack of mourning cloaks. But more of that at another time, in another place. □

Anselm Atkins edits *Wingbars*, the newsletter of the Atlanta Audubon Society, and tinkers with philosophical aspects of evolution.

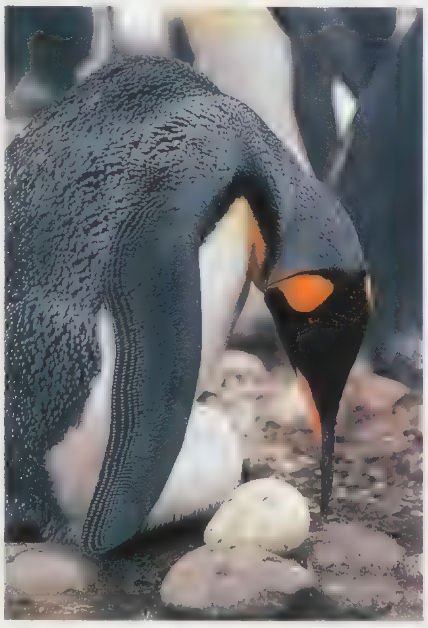
"ARCHIMEDES" BY ROSAMOND WOLFF PURCELL

OAKUM BOYS

TEXT AND PHOTOGRAPHS BY RON NAVEEN

Some birds breed under pretty bleak conditions. Consider penguins which live in the Antarctic. Here the snow never melts, the winds always blow, and food supplies are very irregular. It's a wonder that anything survives.

Because of these harsh circumstances, most penguins have short breeding cycles; courtship, incubation, and fledging are compressed into a few months, so the season's young will be fully feathered and able to fend for themselves well before the onset of winter. Adélie penguins, for example, are on their own just eight weeks from the time they hatch.



ADULT WITH EGG: JEN & DES BARTLETT (BRUCE COLEMAN INC.)

King penguins are an exception. These hardy birds live on the Falklands, Marion, Kerguelen, Macquarie, Heard, Crozet and other islands which encircle Antarctica. While not quite as desolate as the Antarctic continent, the islands do experience summer snows and gales. Nevertheless, the king penguin's breeding cycle is greatly lengthened. The young remain chicks for 10 to 13 months, so they must endure their first winter long before they reach independence. During this time food is limited, and the young will survive only if their parents can fatten them up before winter begins. Chicks produced late in the breeding season usually starve.

King penguins have several adaptations that help them to survive their inclement environment. The female lays just one egg, and to keep it warm she holds it snugly between her feet and a fold of thick skin on her lower abdomen. Occasionally the birds trade the egg in a comic study of maneuverability. As the parent bird incubates, it fasts for days at a time while its mate remains at sea, feeding heavily on squid and fish.

An especially valuable defense against the bitter cold is the young king penguin's thick coat of brown feathers. When first hatched the bird is nearly naked, but within days the down begins to grow until, after five or six weeks, the bird resembles a teddy bear. Unlike the feathers of most other species, which grow in discrete feather tracts, the penguin's down sprouts from all parts of its body. This adaptation is also true of the adult plumage, which provides a thick, waterproof barrier for the bird as it flies through the water in search of food.

Adaptation aside, the chicks' fluffy appearance is quite captivating. Indeed, the birds inspired pet names such as "retriever pups" or "wooly penguins" among the sealers, eggers, and whalers working the southern oceans in the 19th century. In his 1936 classic *Oceanic Birds of South America*, Robert Cushman Murphy, the eminent seabird biologist, said the chicks reminded him of "college students wearing raccoon-skin coats." However, according to Murphy, the aptest name ever applied was "oakum boys," dubbed by the sealers at Crozet.

Oakum is loose hemp or jute fiber, often treated with tar, creosote, or other binding agents. It was used by sealers and whalers to caulk the seams of their ships, and to make their barrels, casks, and pipe joints watertight. The chicks' thick, wooly feathering bore a strong resemblance to this brownish substance.

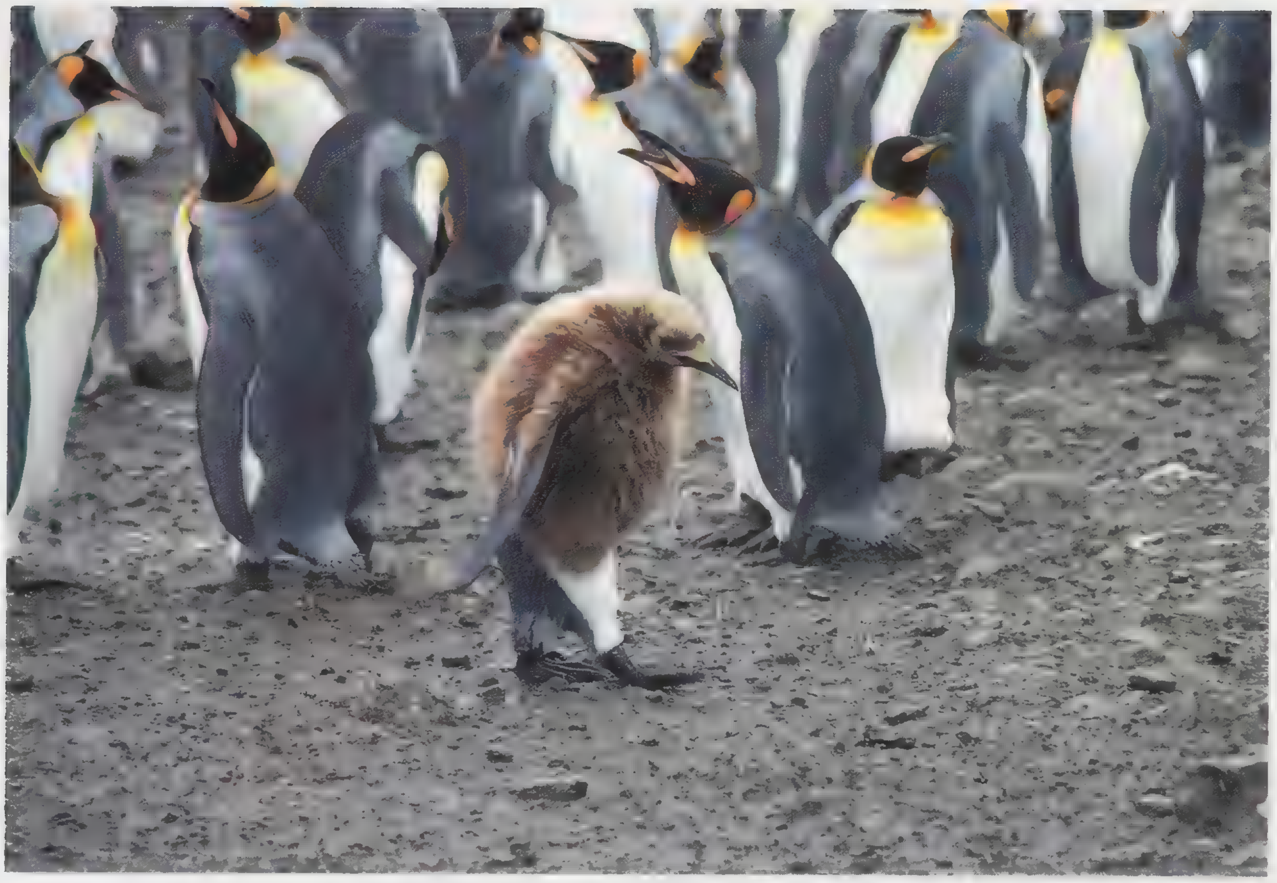
The downy coats of oakum boys (and girls) grow as long as 3½ inches. They are worn until the birds are from nine to 12 months old. Then the down begins to drop, often in clumps, usually starting on the flippers, followed by the belly, back, upper breast, throat, and head. As the down falls out it reveals the subadult plumage beneath, and when young king penguins go off to sea for the first time they resemble pale versions of their parents. In a few years the young will return to the area to breed and produce their own oakum boys.

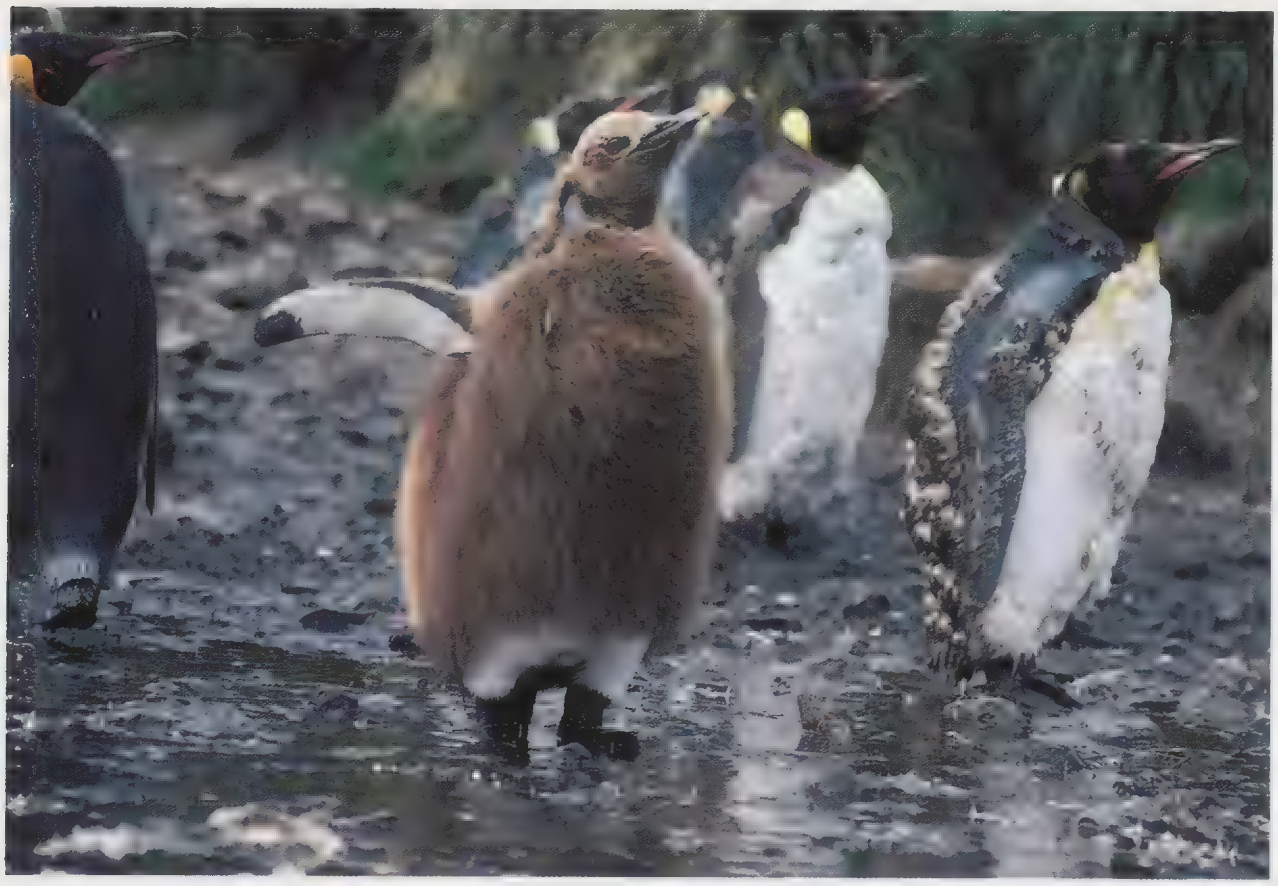
Ron Naveen is a free-lance writer and photographer who leads birding tours to the Antarctic.

Further Reading

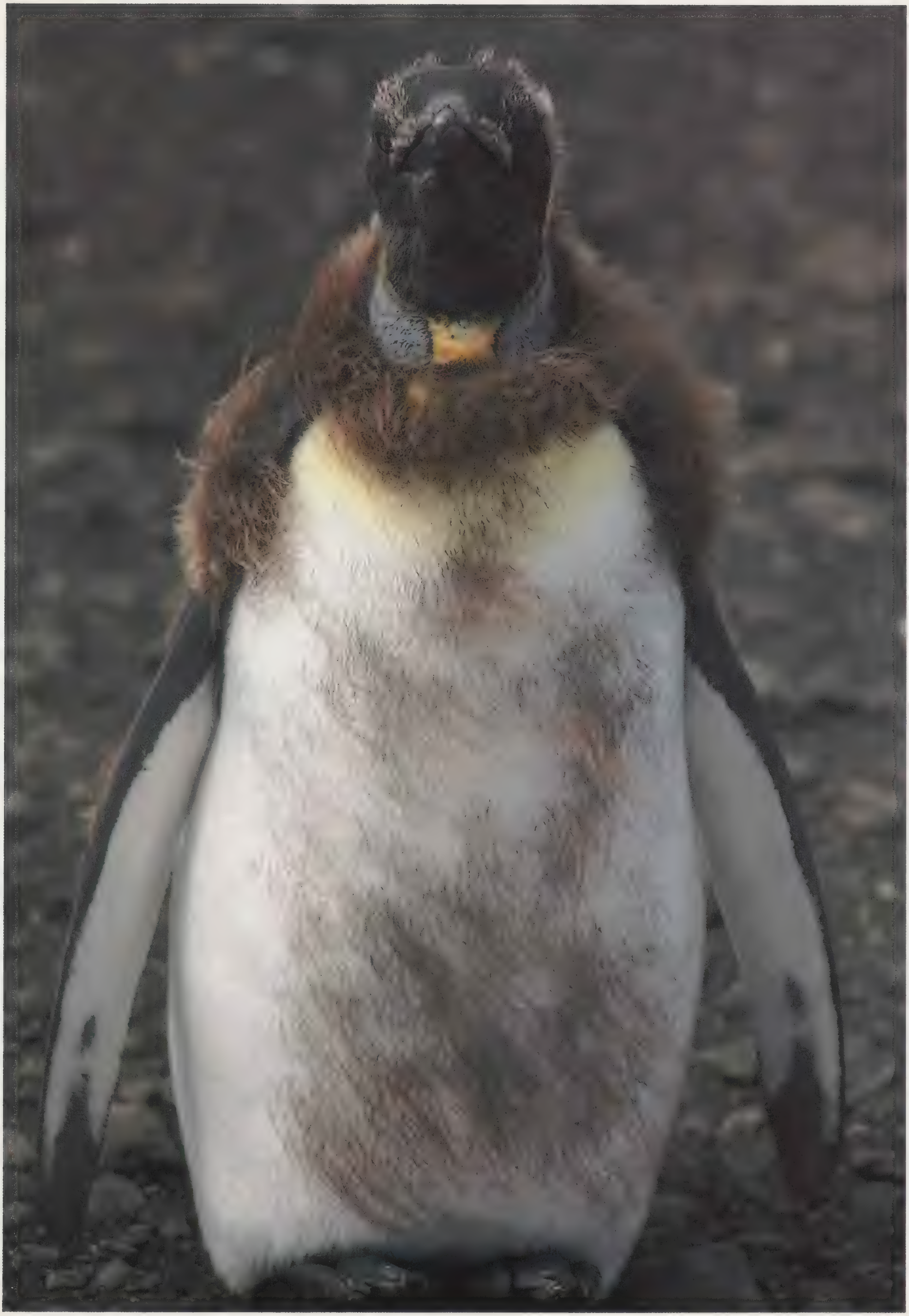
Stonehouse, Bernard. *Penguins*. Golden Press, New York. 1968.

Todd, Frank S. *Sea World Book of Penguins*. Harcourt Brace Jovanovich, New York. 1981.





King penguins breed on islands north of the pack ice in the subantarctic. The birds pictured here are from a colony on South Georgia. They normally lay a single egg and incubate it between their feet and abdominal fold. The birds build no nests and have tiny territories. They breed on muddy flats or sodden fields of grass, where the footing becomes slippery at times. King penguin chicks remain at the teddy bear stage for nine to 12 months, their development virtually stalled—an unusual situation among bird species. So slow is the young bird to reach independence that a pair of king penguins can rear only two offspring in three years. As the young reach maturity, the down begins to shed, first from the flippers, then the belly, sometimes clinging persistently. At last the young penguins will resemble the adults and go off to sea to fend for themselves.

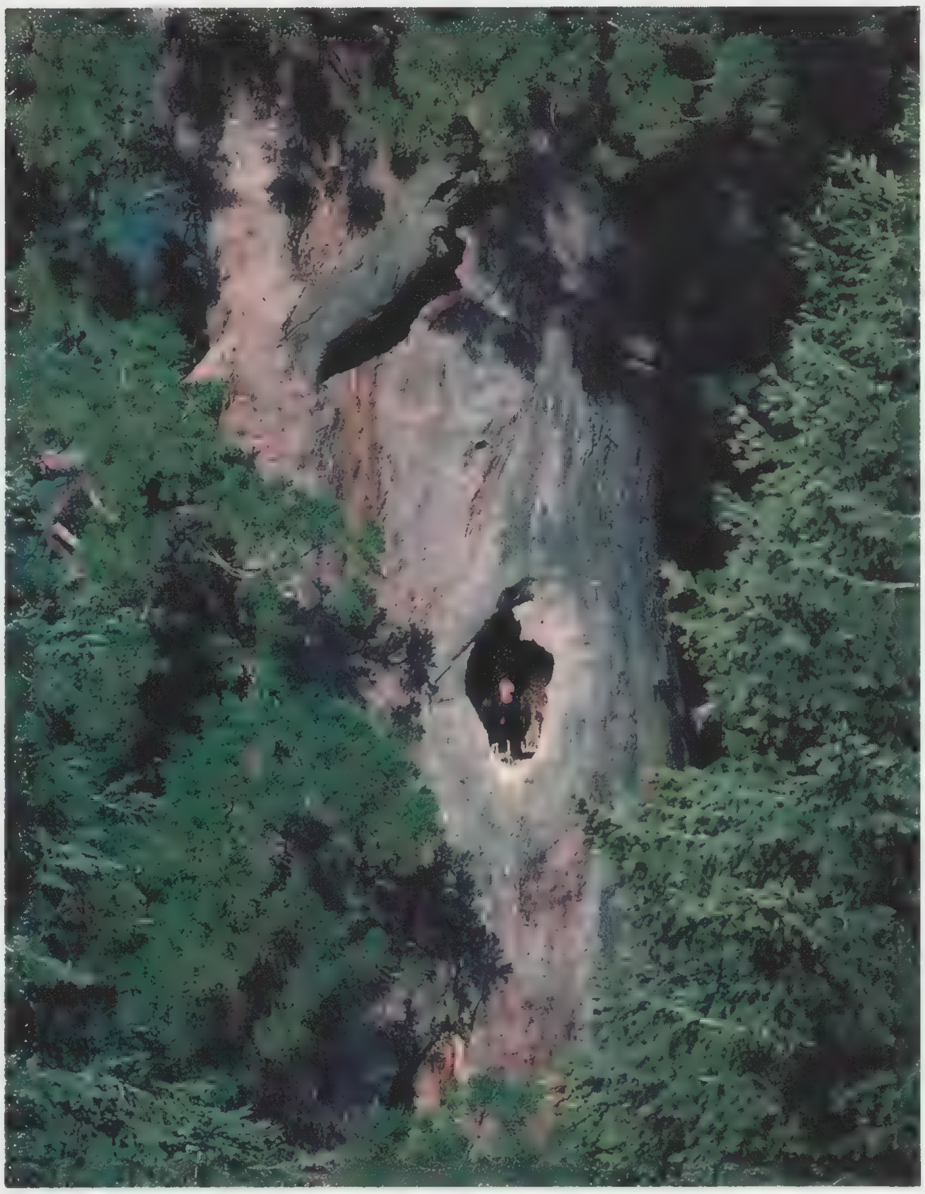


The Condor's Last Stand

IT may be easy for some people to dismiss the vanishing California condor as an inevitable consequence of human civilization. The 20-pound scavenger has been described as a Pleistocene relic, an outdated monster whose needs cannot be met in the modern world. This may be true.

But as the condor population dwindles—it's now down to 27 birds, 24 in captivity and three in the wild—the fight to preserve the species goes on. And what a fight it has been. Not only have conservationists struggled to save condors from shooting, poisons and loss of habitat, but they have fought each other over the best way to preserve the birds.

California condors have been uncommon and restricted to a small range in southern California ever since naturalists began recording their observations. The birds were abundant and wide-ranging, however, during a long-gone time, the Pleistocene Epoch, which lasted two million years and ended 10,000 years ago with the retreat of the last ice age. During the Pleistocene the giant bird soared over much of western North America, feeding on the remains of mastodons, giant bison, and other grass-eating animals killed by saber-toothed tigers and dire wolves. By the end of the Pleistocene these large mammals had disappeared, and with them went the condors.



DAVID CLENDENEN (2)

But not all of them; a small population managed to survive on the west coast. Carl Koford, a biologist who studied condors in the 1940s and 50s, has suggested that as the large land mammals began to disappear, a coastal race of condors survived by shifting its diet to whales and seals that washed onto beaches. From southern British Columbia to Baja California, a few hundred birds hung on for several thousand years—nesting in shallow caves or crevices in rock cliffs, and feeding in grasslands or open woodlands.

Then around 1880 the population began to collapse again. This time, however, the threat wasn't loss of prey, but direct human persecution. The birds' nine-foot wingspan and slow, soaring flight made them easy targets. Many were shot because they were suspected livestock predators (though they never attack live prey), because they were thought to spread disease, for museum specimens, or just for fun.

Persecution may have done more damage to the species than it would have to most others because condors have an extremely low reproductive rate. They don't breed until they are at least six years old, they usually lay only one egg per nesting attempt, and they often don't nest every year. Thus a pair must live for several years before it can raise two young and replace itself in the population. With no enemies and a more than 20-year life span, the low reproductive rate was not a problem—but when the shooting began, the population dropped rapidly.

By the early 1900s the condor population had probably fallen below 100 birds, confined to a small mountainous region of southern California. Much of the shooting then stopped with the enactment of game laws, but the condors' problems didn't end; habitat loss further sapped the population. Their foraging range became hemmed in by fast-growing cities like Ventura and Los Angeles. By 1940 the population hovered around 60 birds.

In 1937 the U.S. Forest Service (USFS) made the first attempt to protect condor habitat by establishing a special refuge, the 1,200-acre Sisquoc Sanctuary in the Los Padres National Forest. This area was particularly important to the birds because many of them nested or roosted there. Then in 1947 USFS added another reserve, the 53,000-acre Sespe Sanctuary. Human activity was sharply curtailed in these areas, but the condor population continued to decline. Some were still being shot. Some may have been killed by poisoned carcasses set out by ranchers to kill coyotes. Pesticides such as DDT, which were proven to affect the reproductive ability of birds of prey, may have affected condors as well. And many died for unknown reasons. As the years rolled by the population continued to drop until by 1978 there were just 25 birds.

For biologists, conservationists, and bird lovers concerned about the majestic vulture, the situation seemed desperate. Thus was born the California condor recovery plan, a joint effort begun in 1979 by the U. S. Fish and Wildlife Service (USFWS), the National Audubon Society (NAS), the California Fish and Game Commission (CFGC), USFS, and the Bureau of Land Management.

The plan outlined several conservation measures. Some were standard—maintenance of sanctuaries, control of pesticides, reduction of disturbance near nests—but the program also introduced two new and controversial steps designed to save the species from imminent extinction. First, several adult condors would be fitted with radio transmitters to monitor their movements. Second, non-breeding birds would be trapped for captive propagation.

The plan was plagued with dissent from the start. Many biologists and conservationists felt that radio telemetry and captive breeding were essential if the condor was to survive the century. According to their view, telemetry would help to identify exactly where the birds nest and feed, and perhaps why they die. Without knowing this information, saving the condor would be almost impossible. Captive breeding seemed important to ensure that some birds would survive even if the wild population disappeared. If a healthy captive population could be established, birds eventually could be released back to the wild once their habitat needs were better understood.

Nevertheless other conservation groups, notably Friends of the Earth, the Sierra Club and some chapters of NAS, urged a hands-off approach. Said David Brower of Friends of the Earth, "The condor is not an electronic toy to play with. We understand, but regret and deplore, the overcuriousity of the biologists who would invade the privacy of the condor and thus imperil one of the most famous and spectacular of all the endangered species."

The differences between the two camps had to do with both conservation philosophy and emotions. The hands-off groups believed that increased habitat protection would do as much as radio tracking and captive breeding to save the species, and that intervention could even speed the demise of the population by stressing the birds. They also had an emotional objection to meddling with one of California's last symbols of free-flying wilderness.

But other biologists said that habitat protection wouldn't work. John Borneman, regional NAS representative in Ventura, pointed out that much of the condor's range was already lost to development. Furthermore, USFS had previously banned all human use of areas within one-half mile of condor nest sites, and had banned vehicles and blasting within a mile and a half. William Conway, director of the New York Zoological Society, summed up the view of the plan's advocates: "The evidence to date very strongly points to extinction unless we do something pretty radical," he told *Science* magazine in 1980.

Despite the differences in opinion, the plan was conditionally approved by CFGC in May of 1980. Trapping of adults was to begin that fall, but the plan suffered a setback almost at once. On June 30, 1980 a wild condor chick died as biologists handled it at its nest on a rocky ledge in the San Rafael Wilderness of the Los Padres National Forest. The researchers were examining it for parasites to determine whether it was healthy. Those involved, Noel Snyder of USFWS and John Ogden of NAS, said the death was a fluke, and that nest checks were crucial. They also pointed out that they had successfully handled another chick just three days earlier. But the chick was dead and one of only two known to have hatched that year, and CFGC suspended the permit for the recovery plan.

Hands-off advocates said the chick's death proved that the condor is highly vulnerable to manipulation. But trapping proponents pointed to successful handling, breeding and releasing of Andean condors, which are biologically similar to the California species. Finally in January 1982, CFGC reapproved the program, but cut back sharply on the number of condors that could be trapped.

Between 1982 and 1985 nine condors were fitted with transmitters and tracked by biologists from the Condor Research Center (CRC) in Ventura, who learned a great deal about the birds' movements and unearthed some clues as to why they were declining so fast. Illegal shooting, collisions with power lines, and poisoning by coyote traps and lead bullets ingested from hunter-killed animals were found to be the culprits. All of the birds that were found dead were on areas where the birds fed, primarily private ranches, leading some biologists to pronounce the condor's foraging range lethal. By autumn 1985 only six wild birds remained, and the population seemed doomed.

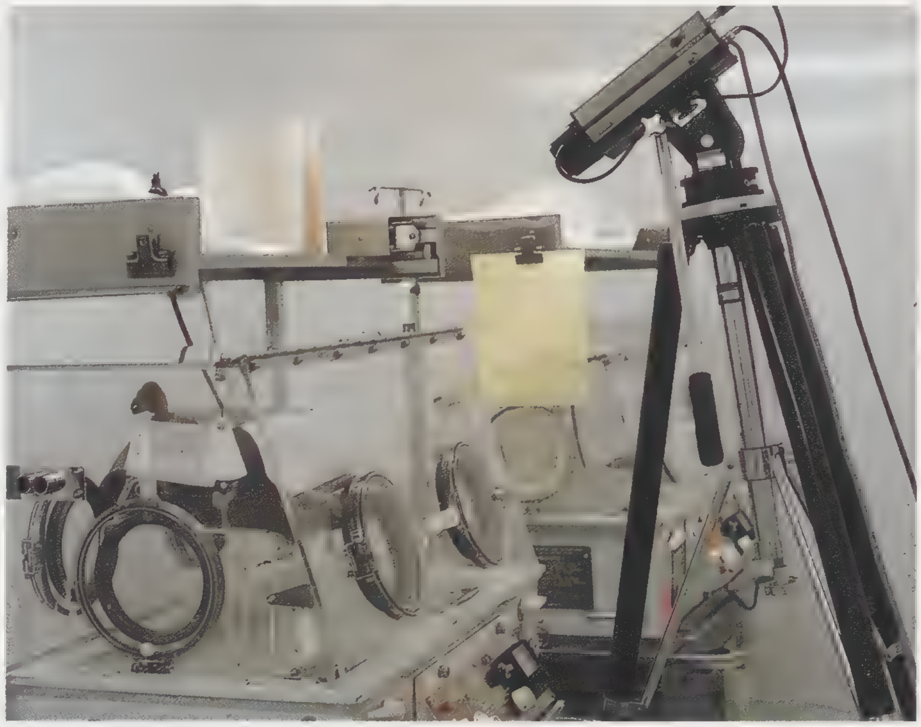
But the last hope—captive propagation—still flickers for the species. As the wild population has dwindled, CRC biologists have been removing condor eggs and nestlings from the wild and raising them at the San Diego Wild Animal Park. The researchers have discovered that when an egg is removed from a nesting pair the female usually lays a replacement, and by taking both eggs, biologists have raised the number of captive condors to 24. All are responding well to their zoo environments, so there is hope that these birds, when mature, will produce young that can be released into the wild.

What about the remaining wild birds? On December 17,

California condors typically nest in shallow caves or ledges on cliff faces. Only two nests have ever been found in giant sequoias, although the trees are found throughout the birds' range. Left, an adult stands at a nest cavity in 1984. The egg below was brought into captivity and produced a healthy chick. The captive population numbers 24.

1985, USFWS proposed that all six immediately be captured and placed in zoos. The only breeding female was known to have high levels of lead in her blood. Also, five wild birds had died of unknown causes the winter before, so the future of the remaining six seemed uncertain. And these last wild birds, which represented several family lines, would increase the genetic diversity of the captive population and help to reduce potential problems from inbreeding.

Once again biologists and conservationists were polarized. Many sided with USFWS, agreeing that the wild birds' demise was imminent and that their genes were needed in the captive population. But others, including NAS, argued that if all the birds were captured, there would be no incentive to protect their remaining habitat from development—and if the habitat were lost, there would be no place to release the birds in the future. This is a real concern, since one of the birds' prime foraging areas—the 11,000-acre Hudson Ranch—is up for sale. Said Glenn Olson, Audubon's western regional vice president, "Capture of the entire population would open the door for destruction of condor habitat that could never be replaced. In the Los Padres National Forest, for example, oil development and road building are now limited within range of condor nest sites. With the wild birds gone, these controls could be lifted."



Heartbreaking failure and heartening success—workers at the San Diego Zoo try in vain to save a condor suffering from lead poisoning, but a newly hatched chick, Sisquoc, prospers in an isolette.

© ZOOLOGICAL SOCIETY OF SAN DIEGO (2)

Right or wrong, USFWS began rounding up the six remaining wild birds on January 3, 1986, starting with the female with lead poisoning. Soon after her capture she died, leaving further doubts about the vitality of the other five. Meanwhile, NAS had obtained a temporary injunction in federal court barring the capture of additional birds. A few weeks later NAS had the injunction changed to allow two of the birds to be captured, which they soon were, and the injunction was overturned on June 6, 1986. But as of late August, the last three birds remained in the wild, partly because the condor recovery team was still divided about the wisdom of bringing them in. The birds' fate should be decided this fall, and it is likely that only hindsight will tell whether the final decision was the correct one.

Even with a captive breeding program, the future of the California condor is very uncertain. So far, no captive birds have bred, so there is no guarantee that the captive population will be viable. And even if captive birds are released into the wild, they may not survive and reproduce. So why bother spending millions of dollars trying to save the species? Why continue the struggle which has made enemies out of those presumably fighting for the same cause? Why not let the "Pleistocene relic" fade into oblivion?

These are difficult questions. Many would say that we humans should never give up trying to save a symbol of wilderness. The condor is a bird surrounded by mystical folklore—a link with prehistoric times and with early years of American history. To give up on this species is to cut an important tie with our heritage.

But will the condor of the future really be the condor of the past? Will it be a majestic beast casting an awesome spectacle as it soars over a desert canyon, or a genetically impoverished relic of its former self, perpetuated only by zoo stock and confined to a vestige of its former range?

A successful captive breeding program will cost several million dollars. Why is the condor so valuable—because it's famous and spectacular? Would this money be better spent on some of the other 500,000 to two million species of plants and animals that have been predicted to go extinct by the year 2000? Might it not be better to preserve rapidly dwindling wildlife habitat than to preserve a few condors in a zoo?

It probably would. But in a less than perfect world, it is easier to raise funds for a large, dramatic form of wildlife than for an obscure one—and condors are more charismatic than the rare modoc sucker and Texas blind salamander. On the positive side, condor habitat is good for more than condors. And large-scale efforts to save one species help to engender support for wildlife conservation in general.

Whether or not the fight to save the condor should go on, it almost certainly will. If it succeeds, the majestic bird may live into one more century. If it fails, the legendary thunderbird will become a memory.

—Richard E. Bonney, Jr.

The ivory-billed woodpecker is not extinct. At least two birds survive in eastern Cuba, where they were sighted last spring by Cuban and American biologists, including bioacoustician George Reynard, a Laboratory of Ornithology Associate. The Cuban ivorybill varies only slightly from the subspecies which apparently has vanished from the southern United States. Woodpecker expert Lester Short of the American Museum of Natural History, another of the biologists to spot the Cuban birds, is optimistic that more ivorybills exist in unexplored regions nearby. The Cuban government has banned all logging in a large area surrounding the location of the sightings, and is allowing only scientists to enter.

Dear Member:

From the cutting of Brazilian rain forest to overgrazing of African savannah, habitat loss is occurring on a worldwide scale. While these are dramatic examples, a more subtle process is also occurring—the "suburbanization" of our own backyards.

The Laboratory's Seatuck Research Program in Islip, Long Island has been busily looking at the effects of growing suburbia on wildlife. Working with the U.S. Fish and Wildlife Service, researchers are examining the Seatuck National Wildlife Refuge and other Long Island reserves in order to answer the question, "How do we preserve wildlife within isolated areas of habitat?"

For the past five years Seatuck biologists have been studying the grasshopper sparrow at Jamaica Bay National Wildlife Refuge, endangered least tern and piping plover populations around Long Island's extensive shoreline, and songbird habitat in local neighborhoods. And, to their surprise, the researchers have become immersed in studies of deer and mosquitoes.

Mosquitoes? At first glance the only thing a bird and mosquito have in common is wings, but the two are related in another way—they use the same habitat. Marsh areas like those at Seatuck can breed mosquitoes of an impressive hunger and enthusiasm. In the 1950s mosquito control was simple—you sprayed with DDT. But as softened osprey eggs and subsequent population declines showed, this was a poor solution.

To avoid harmful measures, alternative control methods are being tested at Seatuck. For example, biologists are deepening pools to create habitats for fish that will eat mosquito larvae and in turn will be eaten by hungry green-backed herons. The researchers are also spraying marshes with an organic larvicide that kills mosquito larvae, but does not harm other insects that are food for willets, yellowlegs, and peeps.

A herd of white-tailed deer also inhabits the refuge. With large areas of the deer's range being fragmented by neighborhoods, it is inevitable that deer will pass through them—nibbling shrubbery along the way. While the neighbors enjoy seeing the deer, the disappearance of a newly planted yew is not greeted with enthusiasm. In addition, the deer harbor ticks which carry Lyme disease, a serious illness being contracted by increasing numbers of Long Islanders. A fence between the sanctuary and the nearest neighbors has been erected, but the problem remains, and studies of the deer's movements are continuing.

Deer and mosquitoes might seem a long way from birds, but they are interrelated. One important lesson coming out of Seatuck is the complexity of managing a suburban sanctuary. To preserve habitat for birds, we must study other wildlife as well. We hope this knowledge will result in a better understanding of suburban birds and in wisely managed oases for all wildlife.

CHARLES WALCOTT, Executive Director

Proceedings of the Second Northeastern Breeding Bird Atlas Conference are now available from the Laboratory of Ornithology. Sponsored by the Laboratory, the conference was held at Cornell's Arnot Forest in April and attracted more than 50 participants from 19 states and three Canadian provinces. The 192-page booklet contains papers on all aspects of atlasing, summaries and a directory of 26 state and provincial atlas projects, and a bibliography. To obtain a copy, please send a check for $10 payable to Cornell Laboratory of Ornithology to: Sally Sutcliffe, Cooperative Research Program, Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850.

Piping plover was added to the U.S. list of endangered and threatened species in January by the U.S. Fish and Wildlife Service. The plovers have declined drastically in numbers since the turn of the century due to habitat destruction and human disturbance of nesting adults and young. Surveys on Long Island conducted by the Laboratory's Seatuck Research Program were an important part of the agency's assessment of Atlantic coast populations. In the 1930s about 500 pairs bred on Long Island. Last summer the number had declined to 100 pairs.

A pre-dawn flat tire hindered the bird-watching efforts of the Sapsuckers, the Laboratory of Ornithology's Biggest Day birding team, in the third annual World Series of Birding held in New Jersey last May. Reluctant to continue competing with no spare, the team lost 45 crucial minutes waiting for the tire to be repaired. Nevertheless, the Sapsuckers managed to find 169 species during the 24-hour event, not enough to capture the out-of-state award, which went to the National Geographic Society's team, but enough to raise $17,000 in pledges from Laboratory members. The Sapsuckers are already planning their 1987 strategy, which will include a spare spare.

—**Steven C. Sibley**

BIRD INVESTMENT

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Mallards

PART of a weekend workshop we conducted recently included watching bird behavior. We took our class of 30 to the grassy bank of a park lake where we sat down to look at mallards. We talked about all the exciting behavior we would see on this gorgeous fall afternoon, but the class seemed skeptical. After all, each of them was familiar with the lake, but no one had ever seen mallards do anything special.

We told them to look for a display called head-pumping, where first the male and female together rhythmically bob their heads, then the male aligns himself with the female, steps on her back and the two mate. Following this the male steps off and swims in a circle while the female bathes.

Binoculars raised, the class began to look for displays. Suddenly someone shouted that he saw a pair head-pumping. With all eyes turned to the mallards, the class witnessed the whole mating display, and when it ended we cheered, not just for the performance, but for the fascinating experience of seeing a whole sequence of predicted behaviors.

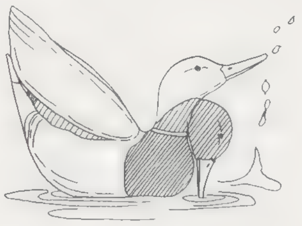
But this was just the start of our mallard exploration, for there were many fascinating aspects of mallard behavior to be seen and heard at the local duck pond.

Some people think ducks just quack, but mallards actually make at least five different sounds. Only the female mallard quacks, the male doesn't make this sound. The female quacks in a series that starts loud and then gets softer, *quaQUACK Quack quack quack quack*. This decrescendo-call is given when she is uneasy or separated from her mate. Her other call is quieter and sounds like a rapid *quegegegegege*. This is the inciting-call and is given during the inciting display, where the female rapidly flicks her bill over one shoulder as she swims behind her mate. It usually occurs when another male approaches and it seems to reaffirm her bond with her mate.

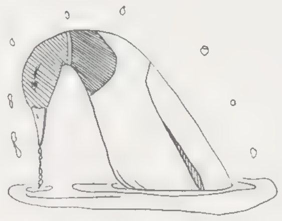
Male calls are entirely different. The most common is a drawn-out, nasal *rhaeb* which you hear as you approach the pond. It is given during disturbances or possible danger. Another call is a fast, two-syllable *rebreb, rebreb, rebreb*. This is given during aggressive encounters between two males. The third male call is the most unexpected; it is a short, high-pitched whistle and is given during the male's courtship displays.

Another interesting aspect of mallard life is the changes in plumage and sequence of molts. You can follow these by watching mallards at various times of year. Mallards undergo two molts per year, but unlike most other birds, the molts of the male and female are at different times. After the young are independent, around midsummer, the female undergoes a complete molt of all feathers during which she is flightless. This is common in ducks but unusual for other birds; most species lose and regrow feathers a few at a time, thus retaining the ability to fly. By fall the female mallard has a new set of feathers. In late winter she undergoes a second molt which involves just the head and body feathers. Her new spring plumage includes special downy feathers which she eventually plucks from her body to line her nest.

The male undergoes his complete molt, during which he is also flightless, in May or June—a month or two before his mate, usually right after she starts incubating. At this time he looks just like the female since his new plumage is brown. The bill, however, differentiates them. Female bills are orange with a blotch of black, while the gray-green bills belong to the males. The male's brown plumage is kept for only two months. In late summer and fall he goes through the same head and body molt the female experiences in late winter. Look at mallards in fall and you will see the males with part green, part brown heads as they gradually acquire bright breeding plumage.



Down-up
The male tips forward to dip his bill and breast into the water, then lifts only his bill and gives a whistle-call followed by a rhaebrhaeb-call. The display lasts no longer than two seconds.



Grunt-Whistle
The male raises the back of his neck while keeping his bill pointed down. A whistle is given when the neck is most arched, and just before this an arc of droplets is tossed into the air. The whole display may take less than a second and is given by small groups of males, often simultaneously, in front of a female.

Why do mallards change colors in these ways at these times? One possible reason the male turns brown in summer is to remain inconspicuous when he is flightless. The female may undergo this molt later because at the time the male molts she is still protecting the young and may need to fly.

Males acquire their bright breeding plumage in fall because mallard courtship begins then. It continues through winter with the peak of courtship activity occurring in December.

Mallard courtship displays are of two types: displays by groups of males, and displays between a male and female. To see group displays, look for three or more males swimming around each other with their heads drawn down so that their white neck ring is hidden. Two preliminary displays—the quick tail-shake or head-shake—will alert you to the more exciting but brief displays that follow, the grunt-whistle, head-up-tail-up, and down-up.

Each of these displays is accompanied by the whistle-call which is often easier to hear than the displays are to see since they happen very

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Donald and Lillian Stokes are authors of the Stokes Nature Guides which include *A Guide to Bird Behavior*, Vols. I and II.

quickly. Group displays are usually done in front of a female and may enable her to compare males and decide which to choose. Once a male and female are paired they stay together most of the time.

It may seem odd that mallards start pairing in fall when they don't lay eggs until the following spring. Studies have shown that paired ducks are dominant over unpaired ducks. This could mean that ducks that pair early are more likely to gain access to food in the event of a shortage. Another possible reason for early pairing may be competition for females since there often are more males in a given flock.

Although mallard copulation can be seen in fall, it is more common in spring when it actually results in fertilizing the female. In spring it is also common to see forced copulation—matings with no head-pumping display and seemingly forced on the female. Studies have shown some striking correlations between the timing of these matings and the sexual physiology of the female.

Most forced matings are by unpaired males and occur within an hour after the female has laid an egg. This is when she has started to develop another to be laid the next day. Without a forced mating she would use sperm stored from her last mating, which was presumably from her partner. But the more recent sperm to enter her body are more likely to fertilize her developing egg. It seems that evolution has finely tuned the timing of forced matings so they have the greatest chance of fertilizing eggs.

The female is so secretive during nest building and incubation that we usually don't know where she has nested until we see ducklings. Mallard nests are built on the ground near water and under the cover of dense vegetation. The male usually leaves once the female starts incubating, and she incubates the eggs and raises the young on her own.

Mallards are fascinating birds. In addition, their sounds, changing colors, courtship displays, and mating cycle can be enjoyed through behavior-watching. And autumn is an excellent time to start, for mallard courtship is just beginning.

—Donald & Lillian Stokes

In the summer, male mallards molt their bright breeding plumage and acquire a drab "eclipse" plumage which resembles that of the female. During much of this time the males cannot fly, and the brown plumage helps them remain inconspicuous.

TIM FITZHARRIS

A Bewilderment of Feeders

JOHN V. DENNIS

DALE & MARIAN ZIMMERMAN (VIREO)

The ground or a slightly raised bird table provide an ideal surface for ground-foraging birds. A ladder-backed woodpecker cannot resist halved fruits on a stick, while Inca doves partake of white millet and milo.

C. ALLAN MORGAN

MILLIONS of people are feeding birds these days, and no wonder. Watching birds in your yard is fun. What's more, every guest has something to offer. Mourning doves feeding from the ground, chickadees hanging from a specialty feeder, or purple finches feeding from a second-story window—all provide enjoyment to the viewer and a close-up look at birds as they crack open seeds, carry off chunks of suet, and interact with other birds.

Feeding birds can be quite simple. Fancy bird feeders and exotic foods are not necessary. A slightly hollowed out tree stump, a large flat rock, a well cover, a roof outside a bedroom window, or crevices in the bark of trees are handy places to stuff or scatter the simplest of foods. Even the ground is not a bad place.

Bird feeders do have some advantages, however. They protect seed from weather and unwanted guests, and enable you to raise food off the ground for birds that prefer not to feed down low. Several types of feeders are aesthetically pleasing as well.

But what type of feeder do you need? A bewildering variety is available, designed for different purposes and pocketbooks. Here are descriptions of some of the feeders, with the advantages and disadvantages of each.

Ground. The simplest way to feed birds is to scatter food on the ground. If you are anxious to attract mourning doves, game birds such as the bobwhite and ring-necked pheasant, and many of the sparrows and finches, the ground is so rewarding that you should not overlook this lowest possible site to conduct bird feeding. Even the red-bellied woodpecker, which is usually a tree dweller, does some foraging on the ground.

To be successful, ground feeding should not be a haphazard activity. Food should be scattered in the same places daily, near cover, and in parts of the yard that are protected from the wind. You should be able to view ground-feeding areas from your windows.

Corn in its various forms is the most economical food to use in ground feeding, but cracked corn has the disadvantage of rapid spoilage in wet weather. Other seeds and grains, such as white proso millet and canary seed, are also well received by ground-feeding birds. Food scattered on the ground will be supplemented by sizable amounts that sift down from elevated feeders, so even if you choose not to throw seeds on the ground directly, ground-feeding birds should always receive some portion of your feast.

Bird tables. One problem with feeding birds on the ground is that the seeds and grains are subject to losses from weather and prowling animals. Therefore, many people who feed birds use various methods to get food up off the ground, where it is better protected and accessible to birds that prefer not to feed on the ground. One simple method is the bird table.

Almost any table will do. All that is needed is a flat, raised surface where seeds, grain, and other foods can be spread as if on a banquet table and where birds will have adequate room for feeding. A table 2½ feet high, 3 feet long, 2 feet wide, with a rim at the edge one-half inch high (to prevent food from blowing away) is a convenient size. A peaked, detachable roof with overhanging eaves looks attractive and provides protection from wind, rain, and snow.

Some of the foods that I offer at my bird table are overripe (but not moldy) fruit, stale bakery products, nutmeats, corn, millet, and some sunflower. The guests that I entertain range from cardinals and evening grosbeaks to starlings and house sparrows. There is little friction among these visitors because there is enough food and space for them all.

I give the top of the table a good cleaning every day or so, and I also rake the ground below. This chore is important for keeping the premises tidy and safeguarding guests from the dangers of infectious disease that might be spread by moldy foods and droppings.

Bird tables are not as popular as they used to be. This is largely because of the high cost of bird food. Most people are anxious to provide food in a manner affording even more protection than a table gives from weather or undesirable visitors. Hence the popularity of hanging feeders. However, having some foods in the open where birds can see them will advertise your feeding program and probably get many more species than you would have otherwise.

Simplest of the hanging feeders are box models, which can be suspended from a line or tree limb, or placed upon a bird table, feeding tray or pole. These feeders look like small houses, with a sloping roof, glass sides, and a bottom tray where birds can feed. Box models are reasonably weatherproof and economical and can be filled with any type of seed—sunflower, millet, various nuts or mixes. Because the seeds trickle out gradually as birds feed, you can fill the feeder and rest assured that there will be enough food for your guests for several days.

No gymnastic feats are required of birds using this feeder, and large birds such as jays or even mourning doves can feed at it. However, this can be a shortcoming as well as an advantage. A few hungry blue jays or evening grosbeaks can monopolize a box feeder. Also, box models are hard to clean and moldy food often accumulates on the trays. Therefore, more specialized hanging feeders have been designed which are easier to clean and exclude some of the bullies while allowing smaller birds to get their fill.

Tube feeders. Among the most successful of the specialized hanging feeders are tube feeders such as the Droll Yankee manufactured by Droll Yankees, Inc. of Foster, Rhode Island. The clear plastic cylinder holds food while birds feast from six portals. Food drops down to these outlets as birds feed. This is the old-fashioned principle of the hopper feeder superimposed upon a hanging cylinder. Like the hopper, the tube feeder keeps food protected until it is eaten and allows only a few birds to eat at a time.

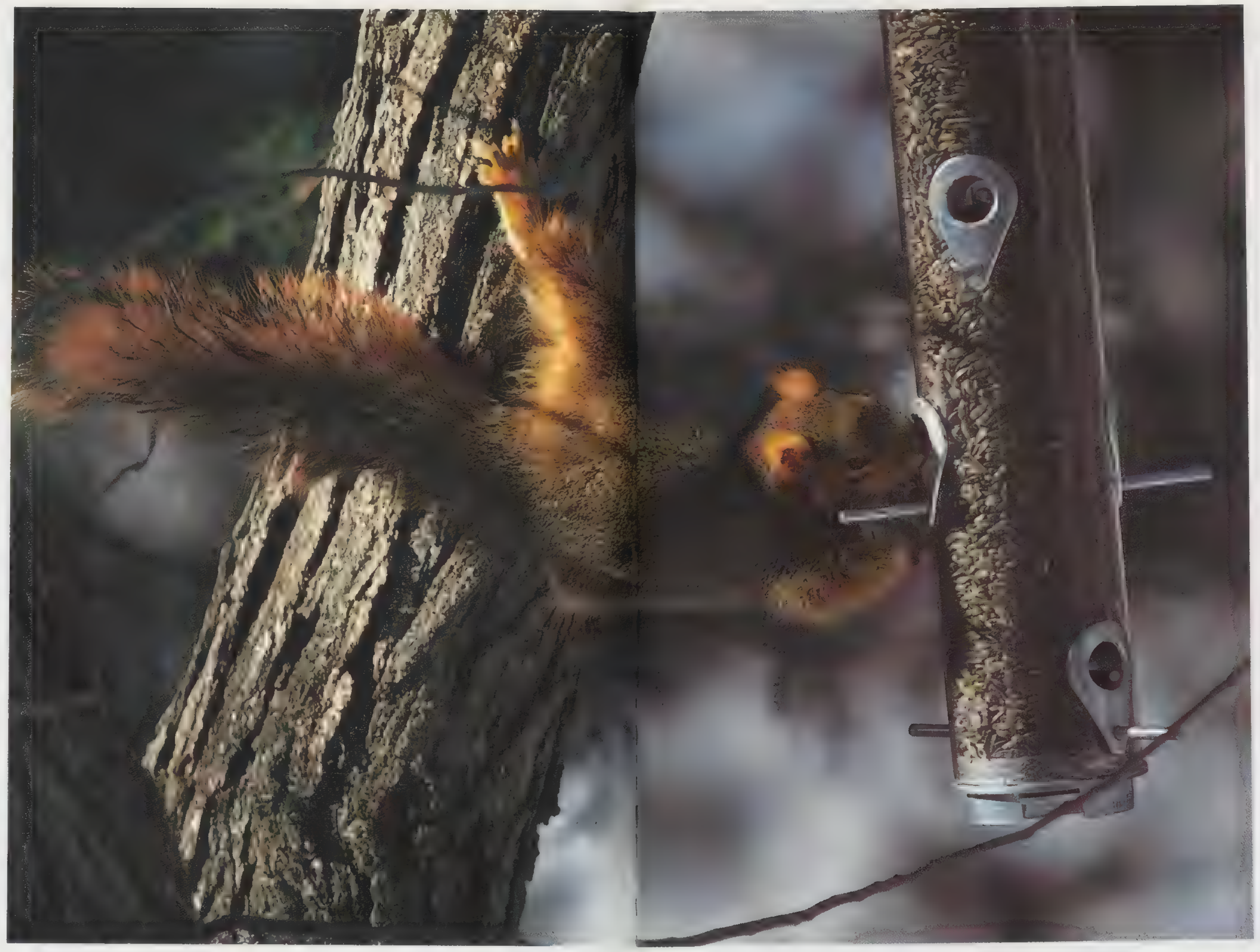
When filled with sunflower seed (black oil sunflower is preferred by most birds) the Droll Yankee is good for attracting small woodland birds like chickadees and the tufted titmouse, and finches, such as the American goldfinch, purple finch, and pine siskin. Because these birds must extract seeds while perched on short pegs just below the holes, or by clinging to the feeder, larger birds such as grosbeaks and cardinals are generally excluded. However, many tube feeders come with removable seed-catching trays which can be attached at the bottom. With these in place, larger birds can use the feeder easily, so tube feeders are quite versatile.

One drawback to the tube feeders is that their superior performance may lull users into thinking that no other kinds of feeder are necessary. If you want to attract a variety of guests, you'll need to use several kinds of feeders. There are still other kinds of hanging feeders that are well worth trying.

Dome feeders. The dome feeder is a seed-filled bowl suspended below a larger dome. Only birds small enough to fit between the bowl and dome can use this feeder. In most models the distance between the bowl and dome can be adjusted to accommodate birds of different sizes. The larger dome feeders hold a lot of seeds, and up to 10 birds can feed on them at one time. The dome also protects seeds from the weather and works fairly well as a squirrel baffle. But dome feeders do have some disadvantages. They are easily buffeted by the wind, and bird droppings are apt to splatter the dome and get into the seed. These feeders require frequent cleaning.

Thistle feeders. Niger seed, also known as thistle seed, is a great favorite with goldfinches and other small finches. The tiny black seeds, which are imported from Ethiopia and India, require special feeders. The best way to offer this food is in tube thistle

GEORGE H. HARRISON (GRANT HEILMAN PHOTOGRAPHY)



TOM MANGELSEN

A suet mixture may be served in many types of containers. Here it is stuffed into a cypress knee where it tempts a red-winged blackbird. Certain mammals find feeders interesting, too, the most notorious being squirrels. They gain access to feeders by making desperate leaps or acrobatic maneuvers from trees or rooftops. Feeders don't have to be feeders per se. Even toy wagons will do as long as birds can get to the food.

feeders made of plastic with very small holes that prevent the seed from pouring out. Woven mesh bags are a poor substitute for holding niger since a large proportion of the expensive seeds spill on the ground.

Suet holders. A whole different side to bird feeding is revealed when we provide suet (animal fat) and various mixtures that can be made with melted suet. These foods call for different feeders and techniques. The first rule is to expose such foods at elevated feeders where they will be well out of reach of prowling mammals. The second is always to secure suet in small containers so that it cannot be removed whole by mammals or bird guests.

Unlike seeds and grains, there is no need to protect suet from wet weather, but most suets should not be made available in temperatures above 70 degrees Fahrenheit since they spoil.

Suet and suet mixtures should be placed at a number of feeders so that all guests will have a chance at this energy-giving food. Unrendered suet can be placed in woven mesh bags such as those used to hold oranges or onions. Hang the bags from nails or tie to branches or a line strung between two posts. Pieces can be fitted into suet holders on posts or tree trunks, or placed in holders in certain windowsill or hopper-type feeders.

Melted suet, to which other ingredients such as cornmeal and peanut butter have been added, generally makes for a better food than pure suet. Mixtures are more nutritious, longer lasting, and liked by more birds. Usually it is a sound practice to render a large quantity of suet at one time. Then the question arises of what to do with the melted suet mixture in the saucepans.

The first step is to spread out newspapers and then pour the partially cooled mixture into suitable containers. You can use jar tops, aluminum foil dishes, plastic cups, milk cartons cut down to suitable sizes, tuna fish cans, even empty citrus rinds. Place the filled containers in the refrigerator for storage; some may be used right away at bird feeders. Small cans may be wedged into wooden frames on posts and tree trunks.

Hanging coconuts. One of the easiest feeders to make, and a handsome one too, is the hanging coconut. Cut a coconut in half at its widest portion, drill three holes at the edge for hanging with string or wire, and attach to a tree limb or line. The other half of the coconut may serve as a roof. The main function of the hanging coconut is to serve as a dish. Fill with suet or a mixture of suet and seeds. This is an excellent feeder for chickadees, tufted titmice, nuthatches, and small woodpeckers.

Hanging logs. The same clientele that frequents the hanging coconut will come to holes bored in hanging logs or sticks which have been filled with a suet mixture. The logs, a foot or so long, about three inches in diameter, and with six or eight round holes for food, are attractive as well as practical. Insert a screw eye at one end and hang from a tree limb or line. Try to get wood to which the bark tightly adheres. Bark improves the appearance of the feeder and provides a surface that birds can cling to. With the addition of perches beneath each hole, the log feeder can be used by blue jays, gray catbirds, yellow-rumped warblers, northern orioles, dark-eyed juncos, and American tree sparrows.

Windowsill feeders. Many people like to see birds right at their windows. A window feeder is apt to invite tamer birds, like chickadees, tufted titmice, and nuthatches. Also, windowsills are often the place where you can expect the occasional bird that may need special attention. The strategy with lingerers and strays is to get them feeding as close to the house as possible. Here they won't be subjected to the heavy competition typical at feeders farther from the house. Suppliers of bird feeders now offer suction-cup feeders that can be attached easily to windowpanes. Feeders of this type are small and made of clear plastic. Be sure to read the directions carefully or your feeder may not stay put. Not only are these feeders the coziest you can provide, but they are easy to service. On cold, snowy mornings you can replenish your feeder from the window rather than having to make a trip outside.

Feeder placement. Encouraging birds to feed at different levels and in dispersed locations helps to reduce friction among various bird species. Small, closely spaced feeders and not enough food encourage some individuals to become bullies. If you want your birds to behave in a reasonably courteous manner, you need to be generous with food and have it widely distributed. With some feeders at windowsills and others at varying heights and distances from the house, birds have a wide choice of places to feed, and you should be able to accommodate a large variety of species with minimal friction.

Bird feeders should be located in portions of the yard sheltered from the wind. Usually the south side of a house will have a good measure of protection because the house itself blocks cold northerly winds. When the south side contains the windows where most bird watching will take place, you have ideal conditions for bird feeders. But even the north side can be suitable for feeders if cold winds are deflected by plantings, a fence, or a wall.

Another important consideration is escape cover to which birds can retire at any hint of danger. Wherever possible, feeders should be located near suitable cover. A maple or apple tree, a privet, lilac, forsythia, or other bushes near the house may furnish moderately good cover. A Tartarian honeysuckle behind a bird feeder makes an excellent tangle where birds can congregate when not eating, and a small thicket of natural growth along the rear property line is an ideal place to establish a feeder or two well away from the house.

If there are cats in the neighborhood, it is a good idea to keep feeders at slightly greater distances from cover than would otherwise be advisable. A cat out in the open where birds can see it presents no serious danger; it is another story when a cat is concealed under a bush near where birds are feeding. At the same time, you should not go to the other extreme and place food too far out in the open. If feeders are to be safe for most users, they should not be over five feet from cover.

Feeders should be located to take advantage of existing trees and shrubbery. Any natural growth, such as a thicket at the rear edge of a yard, should be carefully preserved during this day of complete land clearing for developments. Although newer plantings will in time reach a size adequate for cover and nesting sites, there is really no substitute for the diversity of natural growth.

Lastly, it is always helpful to have some nearby sources of natural foods so that birds do not have to rely upon your feeding stations. While many birds can be attracted even to an open lot with foods, feeders and bird baths, it is still habitat and not these other enticements that makes a yard well suited to birdlife. To attract the greatest number and diversity of birds, you should consider establishing plantings for birds along with your feeders. You'll beautify your yard and help birds at the same time. □

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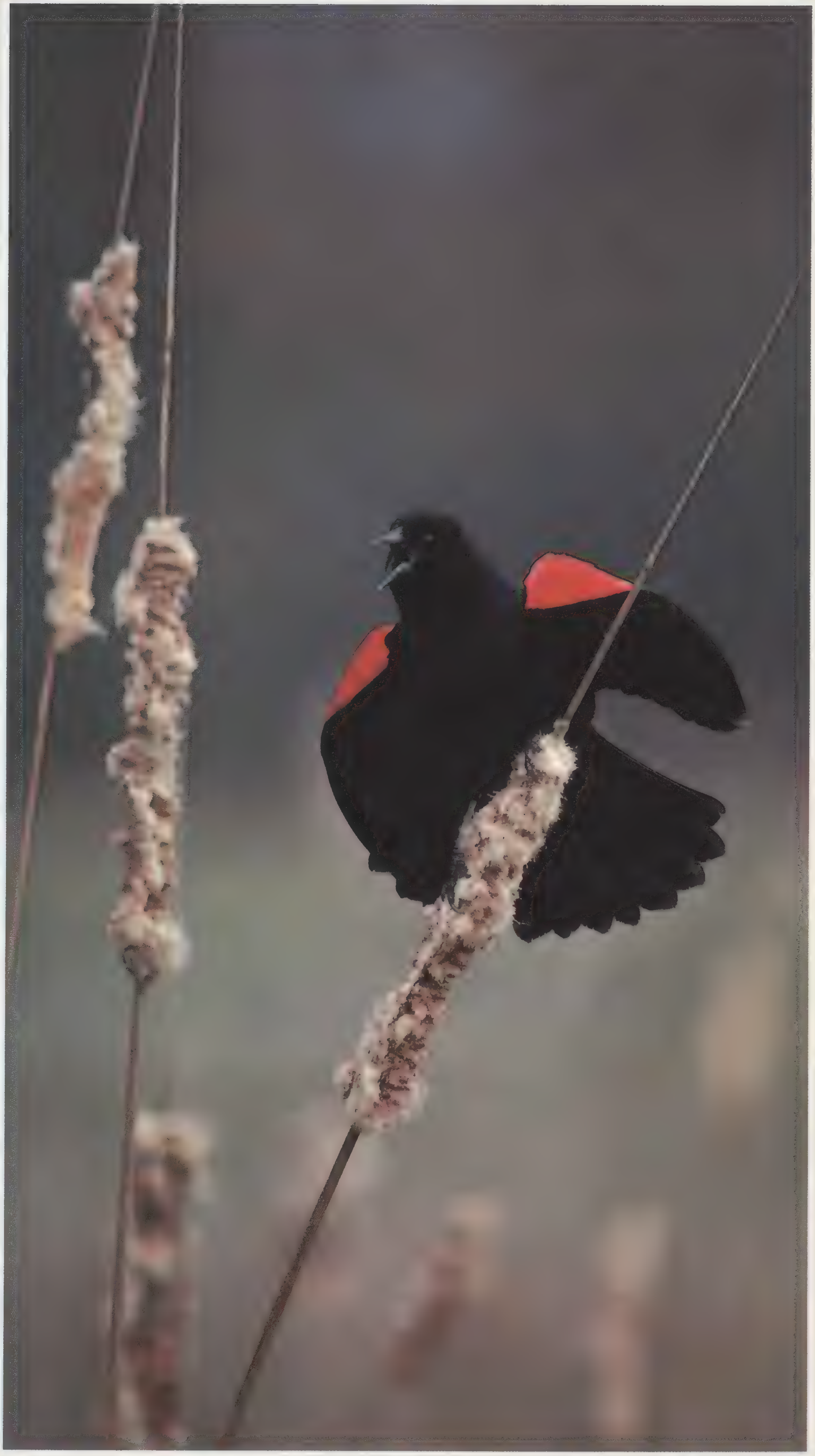

RED-WINGED BLACKBIRD BY CARL R. SAMS II

The Original Droll Yankee

JOHN V. DENNIS

As director of the Massachusetts Audubon Society's Moose Hill Bird Sanctuary near Sharon from 1947 to 1949, I was very much interested in better ways to feed birds. The sanctuary, noted for its bird feeding program, was visited by people from miles around who came to watch birds at the many feeders. Inspired by what they saw, they often returned home with feeders and bird food purchased at the sanctuary. Although bird feeding goes back to the last years of the 19th century, it was just catching on as a popular hobby. What I saw at Moose Hill in those days was only a small taste of what was to come.

Thanks to a day school at Moose Hill, I met Peter Kilham, father of one of the day campers and the man who was to revolutionize the way in which birds are fed. Years later he would invent a tube feeder that would keep food high and dry, within easy reach of the smaller birds that people take such delight in.

Inventor Peter Kilham

It wasn't long before my wife and I visited the Kilhams at their farm near Plainfield, Massachusetts. He had a wry humor and the frank manner and characteristic speech of the New Englander. We hit it off because of our common interest in birds and in preserving the environment. I do not recall that I discussed bird feeders with him. He had a wide range of interests—many of them associated with machines and working with ornamental iron. When I asked him about his interests he said he was a frustrated artist and couldn't make his living at anything!

The story of Peter Kilham can be described as one of not infrequent change from rags to riches and back to rags again. Born in Brookline, Massachusetts in 1905, Peter had a normal boyhood which included an interest in nature. He shared this enthusiasm with his two brothers, one of whom, Lawrence, became a well-known naturalist. After a year at Harvard, Peter became disillusioned with formal education and decided to strike out on his own. For several years he taught geometric design in an art school and designed and made modern furniture. During World War II he received a contract from the Navy to build a gunsight for bombers. This project turned out to be very successful. After the war he designed and built machines for forming tubes used in Pratt and Whitney jet engines. It was at this stage in his career that he owned the farm that my wife and I visited. I recall that sheep were grazing in fields and that bluebirds nested in nest boxes.

There seemed to be an inconsistency about Peter Kilham—why would an inventor of his stature choose a simple life close to nature when riches were clearly within his reach? To be sure, he had overhead and unexpected costs that prevented him from making a profit. But one suspects that he preferred a simple life and having all the time he needed to indulge in his various forms of creativity. Perhaps he looked back longingly upon early days in the field with his two brothers. Machines alone weren't the answer, but if he could somehow combine machines with his love for nature, he would be happy.

The first big opportunity to do this came in 1960 when, using an Air Force radar dish with a microphone in its center, he took up sound recording. For the next few years he was all over New England capturing the sounds of farm life, toots of steamboats, sounds of the sea, and bird songs. His bird song recordings were one of his outstanding achievements. They received plaudits from the press, the Library of Congress, and even the Kennedy family. Station WGBH in Boston still starts its day's broadcasting with them. Recalling these years, Peter says he was always broke or close to it, but that he did his best work when he was broke.

His second and most ambitious venture into combining mechanical skills with natural history came about purely by accident. One day in Barrington, Rhode Island, where he was living with his second wife, Dorothy, he decided to replace a squirrel-chewed wooden bird feeder with one that he had built from scraps in his workshop. At the time he was involved in building a better wood-burning stove.

Already the germ of new ideas about other models had entered his mind. He would build hummingbird feeders, squirrel-proof feeders, grackle-proof feeders, and still others, and he did!

Using a few washers, a piece of plastic tubing, and some scrap metal, he had made a feeder that met his specifications.

Now he would try it out on the birds. In all the years of designing and building bird feeders that followed, Peter kept in mind the special needs of the birds that would be using them. The distance from a bird's feet to its beak must be kept in mind, and the fact that ground-feeding birds are best served if they have a tray to feed from. As for the appearance of the feeder, Peter states that "birds don't care what the feeder looks like so long as they can get to the food."

Deciding that his new feeder suited the birds, as well as himself, he built a second model and sent it to Johnny Appleseed's mail order house. They ordered four gross by return mail. He entered the feeder in the New York Gift Show, and orders for thousands poured in. A manufacturer was found, and Peter at last had a business that produced a profit and gave him all the satisfaction he could ask for. In 1969, the first year the new feeder was on the market, 32,000 of them were sold. In the second year about 90,000 were sold; to date sales of this one model have totaled over one million.

Peter once told me that somehow the first of whatever he turned out was always his best. When he was recording sounds of nature, his first bird song recording "Birds of a May Morning" was his best, so he thought, and the one that furnished the greatest number of sales. Of his bird feeders, now running well over a dozen models, he feels his original Droll Yankee was his biggest success.

When I visited Peter in Barrington in 1969, he seemed mostly engrossed in his wood stove. Although he felt it was far superior to any ever invented, he somehow didn't see enough of a market for it. After visiting his basement, which was filled with a bewildering variety of machine tools, I got him around to talking about birds and bird feeders. He said that grackles were decapitating his house sparrows and eating the brains of these luckless birds. He wasn't concerned about this, but wondered if the grackles might not offer other birds serious competition at his new feeder. Already the germ of new ideas about other models had entered his mind. He would build hummingbird feeders, squirrel-proof feeders, grackle-proof feeders, and still others, and he did!

By the time Peter introduced his Droll Yankee, bird feeding had become big business. Other suppliers were putting out their own versions of tube feeders. Peter told me that a Japanese entrepreneur had introduced a Droll Yankee to Japan and hadn't even changed the name. He went on to say that about 75 percent of the feeders made in this country are based on his designs. Competition didn't much bother him, though. He was too busy working on other models and was confident that he could produce a better feeder.

In 1980, the next time I saw Peter, he was living in Foster, Rhode Island. He had purchased a sizable acreage in the country well outside the town proper. Near the house, he had constructed two buildings—a large machine shop and a smaller building for office space and storage. During this and other visits to his new home, I saw more bird houses than feeders. He had bluebird houses everywhere and a martin house with martins in it, overlooking a large artificial pond. Peter couldn't understand why some of the birds, in spite of his efforts to provide accommodations for them, insisted upon nesting in the most unlikely places. At least two pairs of robins, for example, had built nests on loops of wire under the eaves of his shop.

Not only were the actions of birds closely followed by Peter and Dorothy, but also those of the small mammals, butterflies, turtles, fish, and even the doodlebugs that built their conical pits in the dry soil under the eaves of the house. In spite of the effort that Peter had expended in devising squirrel-proofing for bird feeders, he was on very friendly terms with the gray squirrels on his property. Several were tame enough to take food from his hand.

When I visited Peter in 1983 he was working on a completely new feeder design. He called this one the Garden Pole Feeder. It is a round tray mounted on a metal pole which fits into a heavy base made of a round steel rod formed into a circle. Hooks are available for hanging flower pots or other feeders above the feeding tray. A baffle keeps squirrels away and a dome roof protects the food from the elements. I have now tested this feeder for three years and have found it to be squirrel-proof.

The final test of a bird feeder comes when it is placed near the house and filled with food. If the birds respond properly, Peter knows that he has another feeder worth putting on the market. Sometimes his feeders do not pan out. He scrapped one model after spending many months on it and some $20,000. For every 10 feeders he designs, nine are scrapped. He says that the greatest mistake an inventor can make is to fall in love with his own work.

Peter believes that the buyers of bird feeders also have responsibilities. Feeders should be cleaned often and thoroughly, for instance. There is no way he can design a feeder to prevent a few moldy seeds from accumulating at the bottom of a tray or tube. Probably his biggest peeve is that people insist upon putting every kind of seed except the right one in feeders. Sunflower seeds should go into his tubular feeders, thistle into his thistle feeder, and 1:4 parts sugar water into his hummingbird feeders.

As a step toward overcoming the tendency to use the wrong food in the wrong feeder, he recently created the Super Yankee. It is a tubular feeder with perches and trays adjustable for any type of seed and it is attractive to nearly all birds. Would this be his final feeder?

In June of 1986 my wife and I visited the Kilhams at their home in Foster and again were taken on a tour of the sights. Peter, as spry as ever, was talking about putting an oriole feeder on the market to be filled with sugar water just like hummingbird feeders.

"I never run out of ideas," Peter said. "Ideas are what keep me going." □